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QUIZ
Series Introduction

Welcome to the third segment in a four-part series on handpiece maintenance. This course material is designed for CDAs, however other dental professionals will also benefit from studying this material.

The four segments are to be taken consecutively, starting with segment one. You are encouraged to complete all four segments, however it is not mandatory. You will receive a certificate for each segment you successfully complete.

It is suggested that you print this material and file it together with the past and future sessions when you take them, so that you have a cohesive personal reference. You will need to refer back to this document in future sessions, as well as in your daily tasks. Completion of all sessions in this series will grant you a thorough overview of all aspects of handpiece maintenance.

Purpose of the Series

The objective of this series is to help you become a better managing CDA in the arena of handpieces and their related aspects, making you a more educated and valued CDA and employee—a benefit to the practice and the patients!

The purpose of this series is more than to obtain mandatory continuing education credits to maintain your professional standing. The purpose is to assist you to do your job better in your chosen profession. You will become better at dealing with an important aspect of clinical management, which is a necessary part of the profession. You will obtain credits because you are a better professional. You will become a better assistant to the dentist and a better clinical professional in safeguarding the clinical needs and the health of your patients.

Your value to that clinic, and any other clinic in which you may work in the future, will be enhanced.
Introduction to Session 3

This session assumes that you have completed sessions 1 and 2. You will need to use the information therein for reference materials in order to properly grasp the factors outlined in this session.

Session 1 included a brief history of handpieces; the different classes of handpieces as they are segregated for maintenance purposes; many of the common factors involving handpieces and friction; lubricants as they apply to friction-relief; and recommendations on how to understand, research, and access the quality of proper lubricants.

In session 2 we discussed requirements for the clean room, including equipment that is required to maintain handpieces effectively and efficiently. We discussed general do’s and don’ts, and we learned about the practical maintenance on high-speed handpieces. We touched on many factors that apply to high-speeds, couplers, and a number of recommendations that apply to all handpieces, such as the cleaning of threads and other areas of handpiece maintenance. We discussed the viscosity factors of lubricants, and went more in-depth on lubricants for handpieces.

In session 3 we will deal with electric handpieces. Because there are many similarities in dealing with non-electric (but still complex) geared contras and attachments, we will deal with them in this session as well. Also included in this session will be both the air-driven and electric-driven straight attachments.
Geared Handpieces and Electric Handpieces

We have stated that for purposes of maintenance, handpieces should be broken down into four classes. To simplify this session, we will, with exception to some specific references, call the class of “complex and geared handpieces” and “geared attachments and electric handpieces” by the same name of “complex handpieces”. Please review the appropriate sections of session 1 relating to the classes, and the differences between those classes to refresh your memory. It will help you a great deal in this session to know that material well.

The Differences

Quoting from session 1: “The contras and simple attachments can be partially dismantled for proper maintenance of the contra, transmission axle, and head, so that they can be cleaned and easily lubricated.”

Electric handpieces cannot be disassembled for clinic-based maintenance. They are a one piece attachment with the housing, the transmission gears, and the head as one integral unit, and these MUST be maintained in a specific manner at the clinical level. They are gear-driven, very expensive, and they will burn out quickly (not to mention possibly burning the mouth of your patient with an over-heated head) if not properly maintained.

Electric handpieces, complex handpieces, and straight attachments must be lubricated and purged after every clinical use, due to their structure.

This summary defines the major difference: the simple handpiece can be easily broken down into its segments, whereby those segments can be individually and easily cleaned, as opposed to complex handpieces and attachments, which cannot:

a) Be dismantled for segmented maintenance, and/or they

b) Have complex gearing that requires special maintenance treatment.

Note that we are, in some aspects, at odds with that statement. You can have a 64:1 contra attachment that is an E-type contra which has a removable head and transmission axle, and segments can indeed be disassembled from the attachment, and maintained as simple segments separate from the contra. However, the contra/attachment itself belongs properly in the class of geared, because it is different than a 1:1 ratio (simple attachments), hence, we must differentiate it from the simple contra, and handle it differently. It is a very important distinction.
The simple attachment is a direct drive, running at one speed from the handpiece through the attachment, turning the bur at the same speed that the handpiece motor is turning. The complex attachment, with either increasing speed or decreasing speeds, has gearing in it so that the bur is turning at different speeds, either faster or slower than the motor.

It is the gearing between the handpiece and the head, and how the handpiece is configured, that we must address in proper maintenance procedures.

**Lubricating Difficult to Reach Areas**

**Having lubricant reach where it is needed for relieving friction:**

Lubrication is the only thing that stands between a smooth-running handpiece and a handpiece that is in imminent danger of premature failure. In prior sessions we discussed the difference in the quality of lubricants, including the importance of utilizing only the best quality lubricants with high viscosity, self-inherent cleaning properties, and other factors. Review those factors; they are the key to proper maintenance. With that stated, assuming you have obtained a quality lubricant as defined in prior sessions, we will deal with the other lubrication factor--having the lubricant reach to where it is needed.

Analogy: Picture tipping a drop of liquid down a straight tube. The lubricant has no problem reaching the end as it has nothing to interfere with its passage. Next, picture a tube with bends, kinks, small areas, large areas, reversed angles and turns, and confined spaces with very small gaps that the lubricant must find a path through. It’s like a maze, and it is difficult for the lubricant to get through without some force. However, continuing the analogy, were you to drop the lubricant into the maze and then blow air through the tube, that would force the lubricant through. That would work to get the lubricant properly distributed through the maze.

Getting lubricant through the straight tube (relating to simple attachments) is a matter of gravity; it is basically falling to its end destination. Getting it completely through the maze in the above analogy is a totally different thing. This is, however, oversimplification; there are still bearings and bushings that the lubricant must be forced through in a simple handpiece, but it does not nearly compare to the maze of the complex handpiece or attachment.
We mentioned in session 2 that an air syringe located in the clean room is needed for efficient maintenance of all attachments, heads, and electric handpieces. The reason will become obvious as you continue reading.

The illustration that follows points out that a geared tool can be extremely complex, with many parts that create interference in the movement of lubricant. If the lubricant has not been forced to travel through the ‘maze’ for the full distance of the handpiece, then you will have some parts that are running dry or non-lubricated, creating unnecessary friction that wears out the handpiece.

**Complex E-type Geared Attachment**

This is a picture of a geared contra-angle that fits to an air-driven slow-speed motor. As you look at this illustration (starting at the bottom), ask yourself: How can I possibly ensure that all the tiny parts of this tool become properly lubricated? Does putting a couple of drops of sub-quality lubricant into the end and then simply sterilizing the tool do a proper job? Does the ‘do-it-all’ automated machine force the lubricant through the gearing of the handpiece?

NO, those methods do not do the job. Here are the reasons: If you discount the main housings, there are still over 20 parts to this handpiece that must be lubricated, and then the excess lubricant MUST be purged out. Do not have the head on E-type contras when maintaining them.
If you rely on the occasionally-stated methods that advise you to leave the contra-head attached to the contra with its transmission shaft still in it, and lubricate it without disassembling it, please reconsider that advice. This so-called method of maintenance is expecting the lubricant not only to work its way through the maze shown above--then it must travel the length of the transmission shaft, and then lubricate through the back-end of the head to the head-gearing and the chuck mechanism. If you soaked the complete unit in a bucket of lubricant long enough for it to filter through all those parts, then yes, that would work; but it would ensure a large waste of lubricant, and an extreme mess both inside the handpiece and outside. It clarifies that this is a naive and impractical methodology.

**Electric Handpieces**

To the right is a parts schematic of an electric handpiece, which is different from standard attachments because the head of the electric handpiece is integral to the body (one piece), and it is even more difficult to force the lubricant through to the head. Because the head is integral to the body, it has the same factors involved as the E-type complex contra to contend with (gearing, bearings, bushings, trans-mission shafts). But it is more problematic because you cannot remove the head to lubricate the transmission shaft and the head separately. You must ensure that the lubricant does get through the whole unit, from the tail to the head, and that the lubricant is distributed throughout the moving parts including those parts in the head, and then ensure that it is properly and fully purged.
As can be seen in the above schematic of the electric handpiece, the housing or hull of the handpiece is integrated. It can be disassembled by a knowledgeable person in a properly equipped repair department. It cannot be broken down into its components by the person maintaining handpieces for cleaning purposes in the clinic. That is one major difference between the E-type slow speed contra-angle attachments and the electric handpiece.

**Distribution of Lubricant in Electric Handpieces**

Lubricant being injected into the tail-end of the handpiece **MUST** find its way through to the head of the handpiece. That is much more difficult and much more important for *electrics* than for the *complex* attachments for the E-Type. (For the complex E-Type, the head can--and should--be removed for maintenance.). The gearing in the head of the electric handpiece also has much closer tolerances than the E-Type contra attachment, and thus creates much more friction.

**Cooling of the Handpiece Head**

One important factor to bear in mind is that the head of the electric handpiece is kept cool by the water that is running through the air/water lines, typically designed to cool down the operating area (tooth). Hence, the water supply in electric handpieces has a dual task: Not just to keep the tooth cool and without injury, but also to keep the head cool without undue friction injury. Electric handpieces such as this cannot be run without a water supply attached and functioning because the heads will overheat and burn out. Mentioned in other course segments is the possibility of burning the mouth of a patient with the head of an electric handpiece. It has nothing to do with the electric aspect; it is the friction build up mentioned above that could be potentially harmful to the patient.

The following is a public warning from the USA FDA Public Health Notification published December 12, 2007 regarding electric handpieces. The bulletin relates to the fact that with air-driven rotary tools, wear or debris buildup can be easily evidenced by lack of torque or generally poor operation...
Timing of Maintenance for Geared Handpieces and Attachments

Because of the gearing involved, and especially because of the structure of the head of the electric handpieces, these handpieces must be lubricated after every use.

Purging

It follows that they must be purged properly (thoroughly) to avoid the dentist having to hold a handpiece that is exuding lubricant into the operational area, or into the motor (and saying not-so-nice things about the maintenance quality).

!! IMPORTANT NOTE !!

While we must lubricate electric handpieces fully, we must NOT get lubricants into the electric motor. That is a certain way to very quickly ruin an electric motor, and is more often caused by accident than by intent.

If an improperly purged electric handpiece that is connected to the electric motor is held in an upright position, any lubricant remaining in the handpiece will possibly work back into the motor. *Proper and complete purging of the handpiece is a must.*

The Variance of Maintenance Processes: Geared Handpieces and Electric Handpieces

Although they are classed together, as is obvious from the information above, there are slight differences in the maintenance process between geared contra-angle attachments and
electric handpieces. The primary difference, re-stated, is the ability to separate the transmission and head from the contra/attachment for cleaning the segments.

Straight type attachments will be included with geared and electrics in the complex class of handpieces because there are some similarities: straights are one-piece and cannot be disassembled for cleaning; but common straights fit to the E-Type slow speed motors. When they are straight electric handpieces, the same maintenance methods will apply as with electric handpieces.

**Maintenance: Applying What You Have Learned**

In a later session we will deal with maintenance of the heads, transmission shafts, knuckles, and crowns, which are the segments of E-type contra attachments. We are at this point only concerned with complex handpieces: geared attachments (including straights, even though many are 1:1 ratio) and electric handpieces.

We use the same scenario as in session 2: *It has been a typical operation, with visible debris on the exterior, and non-visible debris in the interior. It has a bur still in it. It has been removed to the cleaning area and it is your task to maintain the handpiece.*

**All Handpieces**

1) Leaving the bur in for the moment, scrub (with the knuckle-brush described in session 2) all debris from the exterior of the handpiece with mild soap and water. While doing so, cover the tail-end of the handpiece with a finger to prevent inclusion of the cleaning fluids. (Note: The person in the example to the right is an expert at handpieces, knowing full well not to allow exterior-cleaning soap and liquids into the handpiece. Unless and until you are comfortable in doing so yourself, leave the bur in the handpiece while cleaning it. A) Remove it to place a drop of lubricant into the chuck once per day, and to inject lubricant into it. B) then replace the bur to purge it, and C) remove it again to sterilize it.)
2) Wipe the handpiece dry.

3) Remove the bur.

4) Use a proper adaptor and aerosol spray to inject a quick shot of lubricant into the tail end.

5) For E-type attachments: Remove the head and transmission axle and set them aside. (They are dealt with in the next session; you should have nothing but the geared contra itself in hand for the rest of these procedures.)

6) For straight attachments: At this point, with a dropper bottle, put a drop of lubricant on the chuck-opening mechanism (not the chuck itself, but what turns to open the chuck) after moving it to the bur-removal (open-chuck) state, and work it a couple times as if you were putting a bur in and taking it out. That allows the lubricant to work into the mechanism and keep it well lubricated. If you have not done this before, then put two or three drops into that ring and work it. Put it back to the chuck-closed state when done. At this point, with E-type Straight attachments, you can skip to #9 except put a bur in the straight attachments to run them. If you are using an electric straight attachment, then follow through on #7 and #8.

7) For geared contras and electric motors: Here we run into a problem adhering to rule #1: Keeping the lubricants out of the operatories. Unless the clinic has an electric motor and a slow speed motor set up in the clean-room (the chances are very slim that that is the case): we must break that rule, and carry the handpieces to the respective motors in an operatory.

8) Geared contra attachments, electric handpieces, and electric straight attachments (after point #4) should be clipped onto their respective motors while being held at a distinctly downwards angle, and then run for 20-25 seconds. (Note: Burs should be placed into the electric handpieces for
this process.) Hold a cloth under the end of the handpiece to catch any lubricant that moves through the handpiece and out the end, whether the end of the E-type contra or the head of an electric handpiece. Disconnect it after the proper running time and return to the clean room.

**Notes:** Remember all those gears and paths that the lubricant must follow to get to the heads? **The above procedure is the only way that the lubricant becomes properly disbursed throughout the handpiece.** When it is running with the excess lubricant in it, that lubricant works its way down through the handpiece while being run in this down-pointed attitude.

9) Once per day with electric handpieces, and once per four hours of use with a straight attachment: Put a drop of lubricant directly into the chuck and scrub it with an in-and-out motion for a few seconds with a little proxy brush. That helps keep the jaws of the chuck clean and it will hold burs better for a substantially longer life.

10) Holding the contra or electric or straight attachment handpiece into the sink with paper towel wrapped around the tail end to catch disbursed lubricant that will blow-back: Use the air syringe by blowing air closely and strongly into the tail end. **Note: The purpose is to force the air completely through the handpiece and take excess lubricant with it, as well as any debris that may be in the handpiece.**

   It may take a bit of trial and error to do this correctly and fully, so the key is that it is better to blow for longer than needed as opposed to not blowing into the handpiece for long enough. Have the dentist closely monitor this aspect and feedback to you immediately if there is excess lubricant coming out of the handpiece in the operatory. You can, with a little practice, get the feel as to how long to aerate each different type of handpiece.

11) Finish the task by blowing directly into the chuck for a couple seconds to clear it of any remaining lubricant and debris.
12) If there are fiber optics in the handpiece you are maintaining, clean them with a stick-swab and alcohol as described in session 2, the rear port(s) and the front port(s).

13) Wipe the handpiece off thoroughly (some alcohol on a 2 x 2 helps in this situation). Get all lubricant off the outside.

14) Place it in the autoclave, (if using bags then see session 2) let it complete the drying cycle, remove the handpiece, and store it (maintaining the sterile field).

You have completely and properly done a maintenance task on the complex handpiece: the geared attachment, the straight attachment, and the electric handpiece.

**Maintenance of Contras which have heads such as KaVo types:**

Treat and maintain these contras as COMPLEX tools. In addition, put a drop of lubricant in the space where the head-release turns; where it turns on the contra; and a drop down into the end towards the side of the release mechanism on the contra. (Heads themselves will be dealt with in session 4.)

**Maintaining Electric Handpiece Motors**

**Discussion:** Electric handpieces motors are sealed to prevent lubricant, water, and other fluids from getting into them and ruining them. They are, as stated in the important note above, ruined quite quickly when there is an over-abundance of lubricant allowed to run into them from improperly purged handpieces.

The handpiece clips onto the motor, and the motor is in contact with the surgical area, so the motor must be maintained or they will not receive the handpiece easily. Health hazards are created if surfaces are allowed to stay contaminated between operations. Electric handpieces and motors cannot be disassembled in the clinic.
Maintaining an electric handpiece motor is a very easy task:

1) After every operation, use a disinfectant fluid to thoroughly wipe down the handpiece (all aspects of it, including the line to the electric power supply). Start at the line and clean toward the working end of the handpiece. Do not soak the handpiece by using too much cleaning fluid.

2) (Again, breaking rule #1 is practically unavoidable.) Use a dropper-bottle lubricant container to put a drop of lubricant on the nose-cone that goes into the handpiece and wipe it off, leaving only a fine film of lubricant on the cone and any seals on that section. That will keep the mating surfaces in good condition and allow smooth connection and disconnection.

No further maintenance is needed.

Complex Handpieces and Automated Maintenance Machines

It is highly suggested that you review the effects of cleaners and handpieces in the prior sessions. The same is applicable to any handpiece.

Now that you understand some of the intricacies of the class of complex handpieces, you can understand statements made in previous sessions regards the use of automated handpiece maintenance machines.

“Manual maintenance of all handpieces will produce consistently better results. This is especially true when the statement is applied to complex handpieces.”

The air that is used on automated machines to purge high-speed handpieces spins the turbines and flows through them, taking with it excess lubricant and debris. This is not true of complex handpieces because the air has no easy circulation route whereby the lubricant can be distributed throughout the parts and pieces of the handpiece. Proper distribution of lubricant and purging of the lubricant is not accomplished effectively with most auto-machines.

One thing is certain: unless you have downwards pointing and rotating stations on your machine, you will not get the lubricant properly disbursed throughout the complex handpiece (as was discussed above, then as stated in point #8 of the maintenance procedures). When
you do have both of the above qualifications dealt with on your auto-machine (rotates as it points downward—and there is only one brand known that has that feature—then pay attention to the time span that the handpiece is rotating. The time should be set to rotate for at least 2 minutes, due to the slower speed of rotation of the station in comparison to having it attached to a motor.

**Complex Handpieces and Optics**

Almost all newer complex handpieces that do have fiber optics will have what effectively can be referred to as solid rods. They are very fragile; treat them gently. Refer to the discussion in session 2 regarding the types of fiber optics, and pay attention to the specific treatment of any fiber-optically equipped handpiece. **Do not bump them, or drop them even short distances.**

**The Time-value of Doing it Right**

Although the maintenance tasks involved with these handpieces seem overly complex and varied, you will find in a very short period of time that if you keep in mind the basics that relate to them you will be dealing with the maintenance easily and in a short period of time.

The difference between ‘just getting it done’ and getting it done properly is that of consistently applying what you have learned. Pay attention to each of the steps, and to the background information and reasons for the recommendations made. ‘Perfect practice’ is much, much better than just going through the motions. Your efficiency will improve dramatically as you learn, by practiced routine, to do the same proper procedure every time. That efficiency will certainly reduce the ongoing costs of handpiece repairs, especially those repairs that are due to premature failures that result from poor practices. You will be ensuring that during the life-time of the tools that they operate better, are more easily managed, and are generally in better condition.

You should be able to walk into any clinic, and in knowing the classes of handpieces and how they should be maintained, you will be prepared and able to properly and without hesitation maintain any handpiece type, anywhere.
You should now be able to do that with complex attachments and electric handpieces.

This concludes Session 3. In the next and final session, Session 4, we will complete this study in handpiece maintenance by dealing with maintenance of slow speed motors, and of all the other segments: *simple* attachments, all the common types of heads, other pieces including: transmission axles, E-type connection clips, reversing-equipment controls, and the treatment of contras and threads beyond just maintaining them.
Now proceed to the test. All questions are constructed using a multiple-choice format.

Take the test by logging in at www.cdabc.org, highlight My Desktop > My Events.

The test will be evaluated immediately after you click Grade Now and upon successful completion, verification of your continuing education credits will be forwarded to you immediately by email. A pass mark of 80% must be achieved to receive continuing education credits. Should you not obtain a passing score, you will be notified immediately and given the opportunity to complete the test again.
Please login to the CDABC website to complete the quiz. Highlight My Desktop and click My Events.

1) **Complex handpieces are classed as such because:**
   a) They have many pieces that should be disassembled for cleaning.
   b) They are mystifying to maintain properly.
   c) They have gearing and many parts, and must be maintained in a special way.
   d) They are expensive and need to be replaced often.

2) **A handpiece that is a 64:1 ratio is**
   a) A straight attachment.
   b) A decreasing speed handpiece.
   c) A handpiece that is highly geared.
   d) a, b, are correct.
   e) b and c only are correct.

3) **To distribute the lubricant through a complex handpiece we must:**
   a) Thoroughly soak the handpiece in a container of lubricant.
   b) Use the proper adaptor and an aerosol-spray to force the lubricant through it.
   c) Run the handpiece pointed down before purging it.
   d) Use an air syringe to purge it thoroughly.
   e) b, c, and d only.
   f) a and d only.

4) **When maintaining complex E-type contras/attachments you should**
   a) Leave the head on and purge it as a single unit.
   b) Do all the maintenance tasks and then remove the head for the sterilization process.
   c) Remove the head and transmission axle for maintenance and deal with those segments separately.
   d) Sterilize it properly, and then lubricate it well.

5) **Electric handpieces should:**
   a) Be disassembled for maintenance.
   b) Be lubricated with a dropper bottle; they only require a couple drops.
   c) Be lubricated after every use, the same as complex E-type handpieces.
   d) Be purged lightly so that there is a good amount of lubricant left in them.
6) The water-spray that comes out of the head of an electric handpiece:
   a) Cools the operational area (tooth).
   b) Keeps the dust down so the surgeon can see the operating area clearly.
   c) Adds to the mess, and plugs up often, requiring maintenance regularly.
   d) Cools the head of the electric handpiece to prevent friction.
   e) a and d only.
   f) a and b only.

7) What is true about electric handpiece motors?
   a) They should be disconnected and maintained like low speed motors.
   b) They need very little maintenance; just wipe them clean with disinfectant and use lube on nose-cone seals.
   c) They are susceptible to excess lubricant running in past their seals.
   d) They run at very high-speeds and need regular maintenance.
   e) a, and c are correct.
   f) b and c only.

8) The purpose of using an air syringe for assisting in the maintenance of complex handpieces is:
   a) To blow out debris from the chuck.
   b) To purge excess lubricant from the handpiece.
   c) To drive the lubricant through the gearing and parts of complex handpieces.
   d) All of the above.
   e) None of the above.

9) Which statement is true of the use of automated maintenance machines for maintaining complex handpieces:
   a) You can use all automated maintenance machines for all types of handpieces with the proper adaptors.
   b) You cannot use any auto-machines for any complex handpieces.
   c) You can use only specially designed automated machines for complex handpieces.
   d) Manual maintenance is always better.
   e) c and d only.
   f) a and b only.

10) Maintenance of complex handpieces is:
    a) Too complex to do easily.
    b) Easy to do if you skip some steps.
    c) Not necessarily simple, but easy to do properly with some practice.
    d) Specialized and different from other handpiece types.
    e) a and d only.
    f) c and d only.