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ORTHODONTIC PLIERS AND STERILIZATION PROCEDURES

Questions and answers
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1) Do Orthodontists really need it?

According to Starnbach(1) orthodontists have the second highest incidence of Hepatitis B among dental workers.
Sterilization of orthodontic pliers is necessary to avoid any risk of cross infection.(2-3-4)
Although unlike surgeons, orthodontists generally do not work in a blood contaminated area, orthodontic arch wires and ligatures can traumatize patients' mucosa, causing bleeding.
A recent survey indicates that orthodontists and chairside assistants receives an average of about one cut per week.

2) What are the main problems related to sterilization of instruments?

- -cost
- -time of sterilization
- -increased workload for office staff
- -damage to pliers

Orthodontic instruments present special problems since they have large, difficult to clean hinge areas, sharp angles, cutting edges or pointed ends that can be potentially damaged by corrosion using autoclave sterilizers which use water vapors.
Chemiclave (chemical vapors) sterilizers can be used with minimal corrosion and damage to cutting edges.
Rapid Dry Heat (RDH) sterilizers which use no vapors have no potential risk of corroding instruments.

3) Is corrosion of pliers preventable?

Chrome plated pliers are more resistant to damage during sterilization cycles than stainless steel pliers (4).
A good way to test metal quality of orthodontic pliers is performing microhardness tests.
An improvement in hardness following sterilization procedures can be explained as an increase in brittleness and a decrease in corrosion resistance.
There is not much data available on microhardness tests. Mazzocchi et Coll (6) reported a study on Ormco/AEZ and 3M-Unitek (old series) orthodontic cutters in 1994.
New unpublished tests are shown at the end of this article (Table 1).

To avoid corrosion of pliers, manufacturers recommend the following procedures:

- -Clean all instruments of debris and thoroughly rinse with distilled water before sterilization.
- -Dry them with compressed air or towels insuring joints are free from moisture.
- -Position instruments in the "open" position to ensure thorough sterilization of joints.
- -Do not expose instruments to temperatures higher than 380°F (193 °C).
- -Lubricate instruments after sterilization.

4) Has the metallurgic quality of orthodontic pliers improved?

Yes. The OSHA and EPA requirements for sterilization procedures forced manufacturers to produce instruments which could undergo several sterilization cycles.
This has translated into better quality instruments being offered to customers during recent years.
For example the 3M-Unitek Prestige Series showed a high improvement in metal hardness in comparison to the previous series.

5) Are there any manufacturer warranties for sterilization of pliers?

Yes. AEZ/Ormco pliers have a one-year warranty against corrosion and damage.
3M-Unitek Prestige Series pliers have a five-year warranty against corrosion and damage.
Dentronix pliers have a lifetime perpetual warranty.

6) What is the best sterilization method for orthodontic pliers?

Chemiclave and Rapid Dry Heat sterilizers are the most useful in preventing corrosion. (4-5)
Chemiclave, which uses an alcoholic solution, reduces rust on instruments, has a short time of sterilization and a low temperature in the sterilization cycle (270°F).
Instruments may be inserted in polyethylene paper pouches and stored in the office.
The major disadvantages are chemical solution costs and fumes.
Rapid Dry Heat units were proposed at the end of 80's, in order to avoid staining and fumes and to reduce time of sterilization using a higher temperature (340°F).
Instruments can be positioned on the proper racks without packaging.
Major disadvantages are electricity costs and light color changes (browning) of the pliers' metal surface.
A study on the effects of these two sterilization methods on orthodontic pliers (3M-Unitek and Ormco/AEZ) showed that RDH seems to produce minimal effects on metal hardness even if these results are less predictable than chemiclave ones (Table 1).

7) Are there any other factors which can result in better long term resistance?

Yes. Lubricating hinges after every sterilization cycle is very important to preserve pliers.
Silicone lubricants (AEZ # 803-0701) are better than oil lubricants.
Silicone can be used to lubricate hinges even before sterilization.
Oils should be avoided because of the risk of interfering with heat conduction during sterilization.

8) Is plier storage important?

Yes. Orthodontic instruments must be arranged in appropriate trays, packages or sterilization pouches to facilitate a well organized cross infection control program.
Everything that will not be used immediately should be wrapped or packaged in order to keep it sterile.
Covered metal trays are very popular in the UK (4).
Since aluminum appears to be an environmental pollutant, IMS cassettes have become more popular during the last few years.
They are light weight resin cassettes which have a capacity for 12-18 instruments and a section to hold disposable or miscellaneous items .(4)
Trays provide safe and aseptic storage of instruments with no risk of being punctured by sharp instruments.
Sterilization pouches are very useful for single instrument storage.
They enable easy identification of the instruments and may be stored safely for one year.

MATERIALS AND METHODS

2 groups of 4 orthodontic pliers received 400 sterilization cycles:

- -the first group in a Chemiclave 6000 (270°F, 1.36 ATM for 20 minutes)
- -the second in a Dentronix DDS 500 Rapid Dry Heat (375°F for 13 minutes)

Each group of cutters contained:

- one Eczurra one piece cutter No. 0512
- one 3M Unitek Prestige Series pin and ligature cutter No. 753
- one AEZ/Ormco minidistal-end cutter with hold No. 0501
- one 3M Unitek Prestige Series safety hold universal cutter No. 756

The cutters were inserted into the recommended polyethylene-paper pouches, as recommended by manufacturers, for chemiclave cycles.
For RDH sterilization, pliers were positioned on the proper racks without packing them.
Every 100 cycles, pliers were cleaned and lubricated.

Orthodontic cutters were checked for Vickers hardness, discoloration and tarnish, before and after sterilization.
Each cutter was measured with a Durimet Microhardness Tester.
The tests were performed using a force of 500g on the cutting edges (4 tests for each cutter).
A mean value of the 4 tests was finally reported.

Discoloration and tarnish were judged by 2 metallurgic experts (not orthodontists) without SEM or lens. Grading was defined as:

0: no tarnish or discoloration

+: tarnish on less than 1/3 of the pliers surface

++: tarnish on less than 2/3 of the pliers surface

+++: tarnish on more than 2/3 of the pliers surface

Ligature cutters microhardness before and after 400 sterilization cycles

a : 3M Unitek pin and ligature cutter No.753
b : Eczurra one piece cutter No. 0512

Chemiclave_____Rapid dry heat

	before	after	VAR	before	after	VAR
Vickers a	814.25	878	+64 (+7.8%)	905	891	-14 (-1.5%)
Vickers b	676	758	+82 (+12.1%)	565	705	+140 (+24.7%)
discoloration a	0	0	0	0	0	0
discoloration b	0	0	0	0	0	0
tarnish a	0	0	0	0	0	0
tarnish b	0	0	0	0	0	0

c : 3M Unitek safety hold universal cutter No. 756
d : AEZ/Ormco minidistal-end cutter with hold No. 0501

Chemiclave_____Rapid dry heat

	before	after	VAR	before	after	VAR
Vickers c	742.25	791	+49 (+6.6%)	757	804	+47 (+6.2%)
Vickers d	774	817	++43 (+5.5%)	699	692	-7 (-1.0%)
discoloration c	0	0	0	0	0	0
discoloration d	0	0	0	0	0	0
tarnish c	0	0	0	0	0	0
tarnish d	0	+	+	0	0	0

Table 1- The effects of 400 sterilization cycles on AEZ/Ormco and 3M UNITEK-Prestige Series cutters

(Mazzocchi AR, Caprioglio A. 1996)

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