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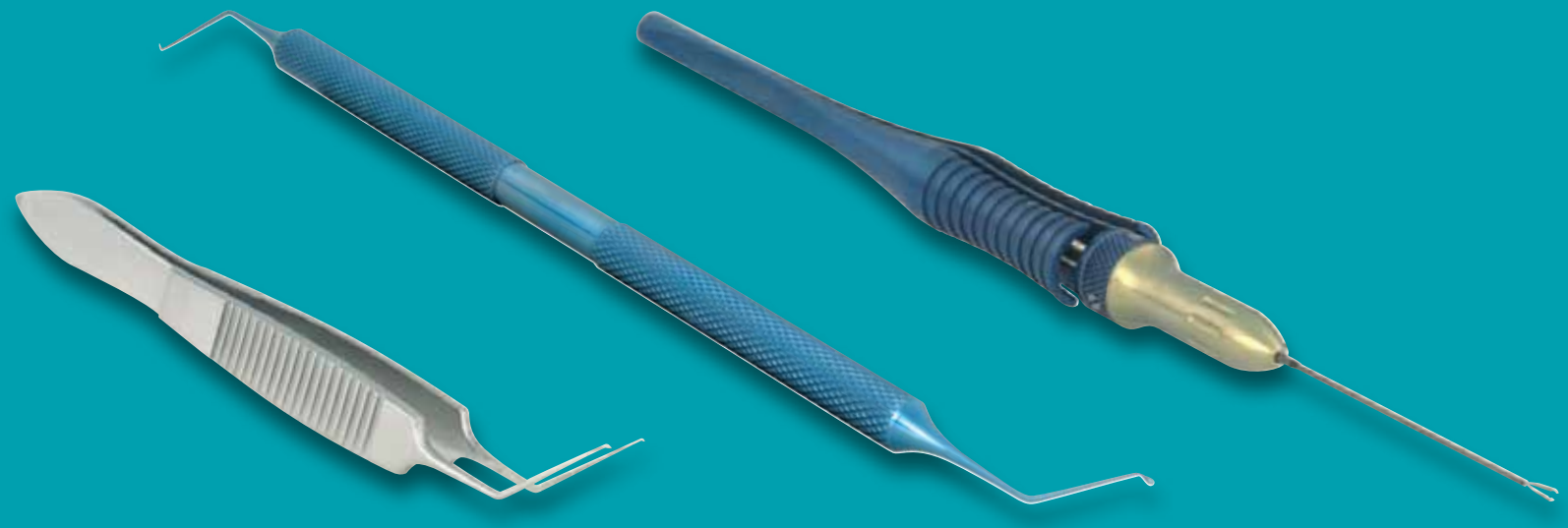
Effective Management of Surgical Instruments

Linda Timmons, RN, BA, CNOR



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Objectives

1. Discuss goals of effective management of surgical instrumentation
2. Describe the process of managing surgical instrumentation effectively
3. Explore problems related to managing surgical instruments

Outcomes

Patient Safety

- Promote optimal surgical outcome
- Reduce recuperation time
- Reduce incidence of infection
- Reduce complications related to tissue damage

Outcomes

Reduce Expenses

- Extend instrument life; reduce replacement costs
  - A major cause of instrument damage is misuse and abuse
- Reduce patient length of stay
  - Reduce expenses related to hospital-associated infection
  - Reduce expenses related to complications

Managing Instruments

Do. . .

- Handle instruments carefully
- Hand instruments one at a time or in small numbers
- Protect the tips of instruments, especially from other instruments
- Wipe blood off instrument immediately after use - Allowed to dry, blood causes deterioration, corrosion and pitting
- Leave instruments in solutions if necessary, for as brief a time as possible; rinsing them thoroughly with demineralized, distilled water

Managing Instruments

Don't. . .

- Toss or drop instruments onto one another or weigh them down by stacking them on top of one another
- Throw sharp and delicate instruments in basins
- Rinse or soak instruments in saline or bleach; prolonged exposure can lead to pitting and corrosion.
- Permit stainless steel to come in contact with strong solutions such as any chloride, any acid, Disinfectants, Salts of any kind, Phenol, Potassium, Mercury, Iodine, Bleach

Management of Specific Instruments

Scissors

- Should be used to cut only the material for which it was designed
- Cutting other materials will cause misalignment, loss of sharpness and blade damage
- Abuse will immediately impair functionality

Management of Specific Instruments

Sharp Instruments

- Rongeurs, osteotomes, knives and curettes should only be used for their intended purpose
- Misuse can cause blades and edges to dull and affect surgical performance

Management of Specific Instruments

Forceps

- Mishandling can significantly impair the performance of these delicate instruments, creating improper alignment of tips
- Improper alignment creates serious problems in function
- Each forceps should be used for the purpose of its design

Management of Specific Instruments

Needle Holders

- Must be matched to the needle size for which it is intended
- Large closure needles will spring the jaws of a delicate needle holder intended for plastic or ophthalmic surgery
- Misuse can throw jaws out of alignment and reduce holding power

Preperation of Instruments for Surgical Procedures

- Clean
  - Rinse
  - Wash
- Lubricate
- Prepare for sterilization
- Sterilize
- Store

Instrument Cleaning

- Rinse all instruments immediately
- Clean instruments as soon as possible after use
- Avoid allowing blood and debris to dry on instruments
- If cleaning cannot be done immediately, place instrument sets in a basin of sterile water
- Include all instruments in tray whether used or not
  - Blood or saline may have splashed on them during surgery

Instrument Cleaning

- Do not soak instruments in saline or chlorinated solutions during or after surgery
- Use demineralized, distilled water to rinse and remove blood and debris
- All cannulated equipment and handpieces should be flushed as specified by manufacturer's recommendations

Video - Flushing a cannula after a surgical procedure

Instrument Cleaning

- Separate delicate and sharp instruments of dissimilar metals from other instruments
- Move instruments to the decontamination area in mesh trays or baskets – instrument trays should be covered and contained when transported
- All instruments opened for a procedure should be cleaned, whether or not they are used

Instrument Cleaning

Hand wash microsurgical instruments

- *Do not put delicate microsurgical instruments in mechanical washer unless it has a delicate cycle*
- Open all hinged microsurgical instruments
- Disassemble microsurgical instruments with removable parts
    - Debris left in box locks or crevices can be baked on in sterilization, causing future breakage under stress

Instrument Cleaning

- Give special attention to suction tube and cannula instruments to prevent caking and obstruction
  - Flush thoroughly with distilled water
- Do not use abrasive cleaners when cleaning microsurgical instruments which can damage or scar finishes

Instrument Cleaning

Mechanically wash other hand-held instruments

- A washer-decontaminators can be used to mechanically wash instruments in an agitated detergent bath
- Place heavy instruments in the bottom of the tray or basket
- Load delicate, smaller instruments in separate trays, scissors and lighter-weight instruments on top

Instrument Cleaning

- Open box locks and protect cutting edges from instruments
- Expose all surfaces
- Do not put microsurgical, powered or lensed instruments in a washer-decontamintor
  - Any instrument which is heat, moisture or pressure-sensitive will be damaged
- Use a neutral pH detergent
- Carefully follow instructions of the equipment manufacturer including recommended detergent

Instrument Cleaning

In hard water areas

- Deposits will accumulate on the walls of equipment after repeated use – regularly clean to remove impurities
- A water-softening system or a softening agent added before each use minimizes formation of scum, scale and discoloration

Ultrasonic Cleaning

- Ultrasonic cleaners utilize high frequency sound waves which create mechanical vibrations
  - Vibrations pull soil from the instrument
  - Microscopic bubbles form on every surface, implode and vacuum minute particles out of every crack
- Ultrasound penetrates areas that a brush or mechanical washer cannot reach
- Use detergent at the proper concentration and temperature as recommended by the detergent manufacturer
- Instruments must be sorted into batches and separated by metallic composition

Ultrasonic Cleaning

Never place different metals in ultrasonic cleaner at the same time

- Stainless steel, chrome plated, titanium, silver, copper and bronze instruments must be cleaned separately
- Mixing incompatible metals can cause pitting, etching, and tarnish
- A neutral pH ultrasound solution is also vital to protect the passivation layer on instruments and prevent corrosion

Ultrasonic Cleaning

- Protect tips, cutting edges and box lock from other instruments
  - Ultrasonic vibration can cause premature wear by instrument contact with adjacent instruments
- Rinse instrument thoroughly with distilled water after the cycle to remove residue and particles from surfaces and to prevent staining
- Check screws on instruments, as vibration may loosen screws
- Instruments should be air dried
  - Protect fine tips and edges which can be damaged by contact with gauze or towels

Ultrasonic Cleaning

- If drying can only be accomplished with a towel, the towel must be lint-free
- Extra care should be taken when processing delicate microsurgical instruments in an ultrasonic cleaner
- Powered instruments should not be processed in an ultrasonic cleaner
- The ultrasonic tank should be drained and cleaned/disinfected frequently based upon the volume of usage. This can be as frequently as every 1-2 hours.

Rinsing

- Following cleaning, rinse all instruments with an abundant amount of water to ensure removal of detergents
- Sterile distilled or sterile deionized water should be used for the final rinse
- Never rinse with saline - saline can cause pitting, etching, discoloration

Lubrication

- Instruments with mechanical parts should be lubricated after cleaning
- A water-soluble, anti-microbial lubricant should be used after each cleaning
- Traces of prior lubrication will be removed during ultrasonic cleaning
- Lubrication helps prevent staining, rusting and corrosion (if specified by the instrument manufacturer)

Lubrication

- Water soluble lubricant penetrates the box locks, hinges and crevices, preventing binding and excessive wear
- Immerse the open, separated instruments placed in a perforated tray in the lubricant
- Do not allow instruments to touch one another while in the tray
- Follow the manufacturers instructions
  - 30-40 seconds is the usual immersion time
- Let the instruments drain
- Do not rinse or wipe the instruments

Lubrication

- Lubricant film should remain on instruments through sterilization and storage for surface protection
- Proper lubrication helps to keep instruments clean by preventing mineral and protein build up
- Replace the lubricant often to keep it clean
- Do not use silicone sprays or other oils which can build up in hinges and crevices and inhibit sterilization

Inspection & Testing

- Crucial step in the processing of instruments
- Critically inspect every instrument after the lubricant bath
- Reprocess incompletely cleaned instruments
- Check for misalignment function, pits, cracks, corrosion, bad edges, nicks, bent tips, loose screws or other damage
- If a problem is observed or suspected, label the instrument and set aside for evaluation and repair
  - Do not further process a suspect instrument
- Sharp instruments, such as scissors, rongeurs, osteotomes, trephines, cystotomes, knives, chisels and curettes should be tested for sharpness

Inspection & Testing

Visual and mechanical inspection is imperative

- Check hinged instruments mechanically to assure that each is functioning properly
- There should be no stiffness
- Joints should work smoothly
- Pins and screws should be intact
- Jaws should be in alignment
- Teeth should meet perfectly

Inspection & Testing

- There should be an absence of dull spots, dents, nicks or chips
- Check plated instruments for worn spots, sharp edges and flaking
  - Flaking harbors soil
  - Sharp edges can damage tissue and surgical gloves
  - Worn spots will rust

Inspection & Testing

Forceps/Hemostats

- If jaws overlap when tightly closed, they are out of alignment
- Teeth of forceps must mesh properly
- Tying platforms must meet evenly over the full length to eliminate damage to fine sutures
- Hold the ring handles in both hands, open the instrument, wiggle the instrument
    - Excessive play in the box lock indicates alignment problems
- If instruments spring open when closed, poor alignment, bad ratchet teeth or poor shank tension is indicated

Inspection & Testing

Forceps/Hemostats

- Test ratchet teeth
  - Close the instrument to the first tooth
  - Hold the instrument at the box lock
  - Tap the ratchet portion on a solid object
  - If the instrument springs open, it is faulty and in need of repair
- Test tension
  - Close the instrument
  - When jaws touch, a space of 1/16" or 1/8" should occur between the ratchet teeth of each shank

Inspection & Testing

Scissors

- Many facilities use a latex product called Theraband to test Operating, Mayo and Metzenbaum scissors
- There are two thicknesses; one for scissors with blades longer than 5 inches in length and another for scissors with blades under 5 inches in length
- Fine corneal and other spring scissors should operate smoothly

Inspection & Testing

Scissors

- Scissors with nicks in the blades should be identified and tagged for repair
- Check scissors for “touch” when cutting
- Look for burrs on blade tips
- When closed, scissor tips should have no space showing
- Shanks should be in good alignment, if not the blades may be sprung

Inspection & Testing

Needle Holders

- If a needle held in the jaws of a needle holder (with the instrument locked at the second ratchet tooth) can be easily turned by hand, repair is needed

Rongeurs

- Ability to cut properly is critical
- Test a Kerrison rongeur to see if it will take a clean bite out of a 3x5 index card
- Bone-cutting rongeurs should bite through a tongue depressor

Assembly

- Instruments should be assembled into sets conforming to AAMI Standards
- Ring handled instruments should be kept open on stringers or posts
- Curved jaws or tips should be protected by pointing them in the same direction
- Cupped or concave instruments should be positioned so as to not collect water

Assembly

- Heavier instruments should be loaded first, separated from lighter instruments
- Tray weight should not exceed 25 lbs
- Wrap small delicate instruments and sharp cutting instruments in separate woven or non-woven towels or special pouches

Assembly

- Do not let instruments touch the sides of a tray
  - Tips and sharp edges can be dulled by bumping against hard objects
- Delicate tips of sharp hooks, etc. may be protected during steam sterilization by using tip protectors that have been validated for use in steam sterilization cycles

Video - Wrapping and labeling the tray for sterilization

Labeling

Label each package with indicator tape including

- Contents
- Control numbers (facility specific)
- Sterilization date
- Expiration date (Note: unless facility practices "event related" sterility)

NOTE:

- Individual facilities may have their own protocol for information to print on each package
- Event-related sterility has been an AORN standard for many years

Sterilization

- Use only the sterilization method recommended by the instrument manufacturer
- Steam sterilization is the most common method used.
- Other sterilization methods that may be encountered in a health care setting include:
  - Low Temperature Gas Plasma
  - ETO (ethylene oxide) sterilization
  - Peracetic Acid
  - Cold Sterilization

Sterilization

- The type of instrument and its sensitivity to heat or pressure will determine the appropriate method of sterilization
- Steam under pressure is the preferred method for instruments which are impervious to heat and moisture
- Lensed instruments, delicate fiber optics and some endoscopes may not withstand heat and pressure. Always consult the manufacturer of the instrument for their recommendations for the best means to sterilize such instruments.

Sterilization

Toxic anterior segment syndrome (TASS)

- An acute inflammation of the anterior chamber, or segment, of the eye following cataract surgery
- One cause is inadequate or inappropriate instrument cleaning, leading to accumulated irritants on the surface of intraocular surgical instruments
- Chemical sterilization methods such as ETO, peracetic acid and low temperature gas plasma that may leave chemical residues on the instruments could promote a TASS response unless the instrument has been properly validated to be free of any residual chemical residues following processing.

Steam Sterilization

- Gravity Displacement or Downward Displacement Sterilizer
  - Injects heat and steam under pressure into the top of the chamber
  - Cool air in the chamber is forced to settle at the bottom, then forced out through an outlet and vented to drain
  - Careful loading of cannulated or internally complex instruments is important to guard against trapping air bubbles inside instruments
  - Disadvantage of requiring long cycle times to completely displace air with steam and penetrate loads being processed

Steam Sterilization

- The Prevacuum Sterilizer
  - Evacuates substantially all the air prior to introduction of steam
  - Injected steam instantaneously and uniformly contacts load surfaces
  - Sterilization is rapid by comparison to gravity sterilizers
  - Multiple prevacuum/steam pulses provide for efficient heating and removal of air from the load prior to exposure.
  - Following the preconditioning phase, the load is then heated to the desired temperature and pressure for the pre-selected exposure time.

Steam Sterilization

- Table Top Sterilizers
  - Table top sterilizers are generally gravity displacement but can be pre-vacuum.
  - They usually have pre-set cycles which cannot be adjusted (e.g. wrapped, unwrapped, liquids). Make sure these cycles are compatible with the items to be sterilized.
  - It is important to follow the sterilizer manufacturer's instructions for installation, load configurations and biological testing.
  - Follow the sterilizer manufacturer's instructions for water quality (usually distilled water) and care, maintenance and cleaning of the water reservoir.
  - Drying usually takes place with the door open, follow instructions to prevent contamination of packs during the drying phase.

Steam Sterilization

- Parameters (given later) may be modified by specific manufacturers instructions
- AAMI and AORN recommends that surgical instruments remain on the autoclave cart, untouched for a period of 30 minutes to two hours depending on the tray configuration
  - During cooling process, place instruments in a low-traffic area away from air conditioning or cold-air vents
- When positioning wrapped instrument sets for sterilization, always allow for adequate circulation, penetration of steam, air removal and condensate drainage
- Sterilant best penetrates packs when a sterilizer is loosely loaded

Steam Sterilization

Minimum Cycle Times for Gravity-Displacement Steam Sterilization Cycles

Item	Exposure time at 121°C (250°F)	Exposure time at 132°C (270°F)	Exposure time at 135°C (275°F)	Drying times
Wrapped instruments	30 minutes	15 minutes		15–30 minutes
			10 minutes	30 minutes
Textile packs	30 minutes	25 minutes		15 minutes
			10 minutes	30 minutes
Wrapped utensils	30 minutes	15 minutes		15–30 minutes
			10 minutes	30 minutes
Unwrapped nonporous items (e.g., instruments)		3 minutes	3 minutes	0–1 minute
Unwrapped nonporous and porous items in mixed load		10 minutes	10 minutes	0–1 minute

NOTE—This table represents the variation in sterilizer manufacturers' recommendations for exposure at different temperatures. For a specific sterilizer, consult only that manufacturer's recommendations.

Steam Sterilization

Table 5—Minimum cycle times for dynamic-air-removal steam sterilization cycles

Item	Exposure time at 132°C (270°F)	Exposure time at 135°C (275°F)	Drying times
Wrapped instruments	4 minutes		20 to 30 minutes
		3 minutes	16 minutes
Textile packs	4 minutes		5 to 20 minutes
		3 minutes	3 minutes
Wrapped utensils	4 minutes		20 minutes
		3 minutes	16 minutes
Unwrapped nonporous items (e.g., instruments)	3 minutes	3 minutes	NA
Unwrapped nonporous and porous items in mixed load	4 minutes	3 minutes	NA

NOTE—This table represents the variation in sterilizer manufacturers' recommendations for exposure at different temperatures. For a specific sterilizer, consult only that manufacturer's recommendations.

Steam Sterilization

- Time/temperature relationship will vary according to:
  - Item(s) being sterilized
  - Sterilizer type
  - Sterilizer cycle
  - Level of bioburden
  - Packaging material
  - Altitude

Rapid Cycle Sterilization (Flash)

- This is a method in which instruments are placed unwrapped in a sterilizer
- Should NOT be used to replace the preferred method in order to save time
- Should not be used in place of a sufficient instrument inventory
- Instruments should be thoroughly cleaned and dried prior to sterilization
- Although necessary in an emergency, it is a process which may shorten the life of surgical instruments – especially delicate ones

Rapid Cycle Sterilization (Flash)

- Difficult to ensure that sterility is achieved
- Unwrapped sterilization (flashing) should only be done in emergency situations
- Compare manufacturers instructions for containers and sterilizer
- Consult AAMI ST79 and your institution's policies for restrictions regarding the use of rapid cycle sterilization (flash)

Rapid Cycle Sterilization (Flash)

Typical Minimum Cycle Times for Standard Gravity-Displacement Flash Sterilization		
Item	**Exposure time at 270° F (132° C)**	**Exposure time at 275° F (135° C)**
Nonporous Items	3 min.	3 min.
Combination of Nonporous Items, Porous Items, Items with Lumens	10 min.	10 min.

Low Temperature Sterilization

- Gas Plasma
- Ethylene Oxide (ETO)
- Peracetic Acid

Gas Plasma

- Low-temperature, low-moisture sterilization process with short cycle time
- Does not require outside venting or drain connection
- No need for aeration or cool-down – instruments can be used immediately
- Cycle time varies according to the capacity of the sterilizer and load contents

Gas Plasma Sterilizing System

Gas Plasma

- Oxygen and water by-products can be safely discharged into atmosphere
- Only non-cellulose-based packaging materials can be used (e.g. Tyvek pouches and polyolefin wrapping material)
- Check with the device and sterilizer manufacturer for lumen restrictions

Ethylene Oxide (ETO)

- Use in sterilizing heat and moisture sensitive instruments
- CAUTION: ETO gas is toxic and potentially flammable and explosive
- Instruments must be properly aerated to be free of any residual chemical residues following processing
- Ethylene Oxide is considered a suspected carcinogen
  - Personnel monitoring for potential exposure to ethylene oxide and special alarms are required (OSHA)

Peracetic Acid

- The peracetic acid solution is heated to 50 - 56° C (122 - 133° F) during a 30-40 minute cycle.
- The sterilizer provides a sterile water rinse at the end of the cycle
- Follow the sterilizer manufacturer's instructions for use and water filter changes
- No aeration time is required
- Items processed by this method must be used immediately

Peracetic Acid Sterile Processing System

Cold Sterilization (Soaking)

- Can be used when sterilizing lensed and mirrored instruments, instruments with bonded parts, delicate fiber optics and some endoscopes which cannot stand heat or are permeable
- Depending on product used, disinfection takes from 10-45 minutes, killing everything but bacterial spores
- Sterilization requires soaking for a minimum of 8-10 hours
- Must be rinsed thoroughly; residuals linked to TASS

Storage

Sterile surgical instruments should be such that packaging should not be compromised in any way

- Should not be crushed, compressed, punctured or exposed to potential water damage

Storage area

- Should be free of dust or pollutants of any kind
- Should be free of temperature or humidity extremes
- Traffic in the area should be held to an absolute minimum

Storage

- Storage should be on carts or shelving, away from the floor, ceilings or walls
- Storage should make sure instruments are kept dry and maintain package integrity
- Appropriate data on each wrapped, sterilized package provides the control data for expirations

Special Handling

Microsurgical Instruments

- Blood and debris should be wiped off after each use during surgery – use a non-fiberous sponge to avoid snagging and damage to delicate tips
- Do not pass delicate tipped instruments across draping material as tooth or tip damage may occur
- Protect the instruments by keeping them in their cases when not in use
- Do not let instruments touch other instruments
- Manually clean and inspect microsurgical instruments
    - A washer-disinfector or other form of automated cleaning may damage delicate instruments
    - Use mechanical washer only if it has a DELICATE cycle

Special Handling

Microsurgical Instruments

- Wash the microsurgical instruments with a soft, plastic bristle brush, cold water and a neutral pH detergent
  - Detergents with a pH above 7.0 are too alkaline – instruments will be stained
  - Low pH, below 6.0, is acidic and will cause pitting
  - Detergents other than neutral pH can destroy the passivation layer and also lead to breakage of box locks and stressed areas
- Rinse all instruments thoroughly with distilled water

Special Handling

Laser Surgical Instruments

- Specialized instruments for laser surgery are surfaced to withstand the impact of the beam and refract it in many distorted directions in order to render the light harmless
  - Silicone beading and black chroming are two surfacing methods used today
  - Instruments are microscopically impacted with glass beads
  - The black chrome finish is applied by electroplating
- When processing, care must be taken to keep the instruments from striking together or tumbling in containers
- To protect the refractive properties, avoid scratching or pitting in the instruments
- Sterilization is best done when these instruments are in trays with protective inserts

Special Handling

Flexible Endoscopes

- Flexible scopes can be sterilized, if needed, in ETO
- Some are compatible with low temperature gas plasma, however the majority are high level disinfected
- Some may require cold sterilization because of permeable composition
- Check manufacturer recommendations before sterilizing
- Handle with extreme care to protect the lenses and fiber optic elements
- Follow the manufacturer's instructions for cleaning

Special Handling

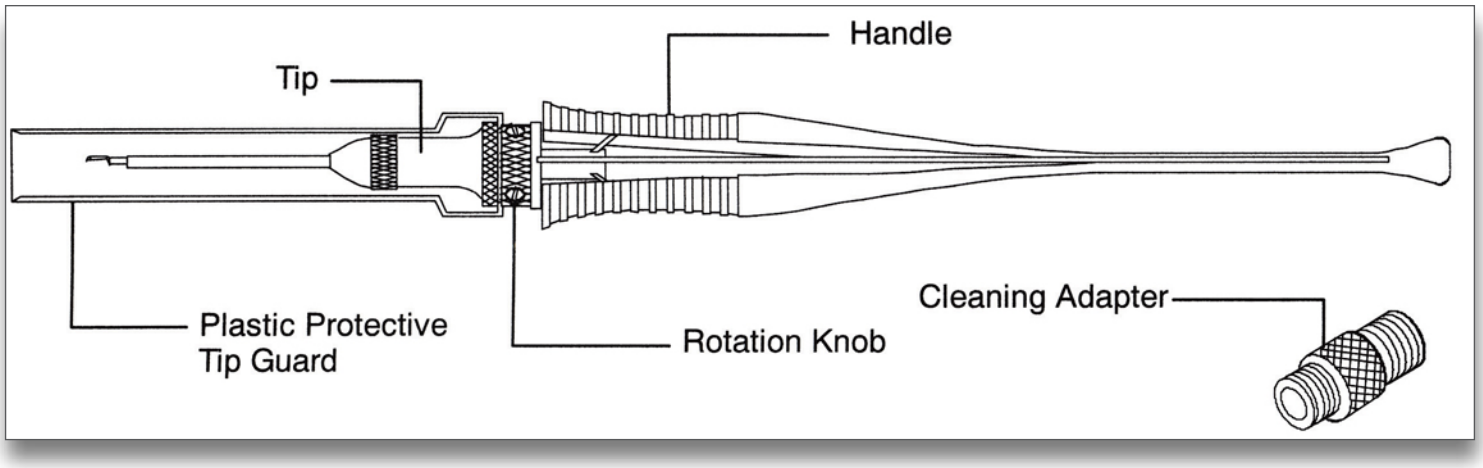
Flexible Endoscopes

- Soak in mild detergent and warm water
- Use soft-bristled brushes, cloths or cotton-tipped applicators for cleaning
- Rinse and dry completely before assembling, disinfection, sterilization and storage
- When using a chemical agent, disassemble and avoid entrapping air bubbles in lumens and channels

Vitreoretinal Instruments

- Retinal instruments require special handling to ensure precise operation

- The intraocular Instrument is designed for posterior segment ophthalmic surgery



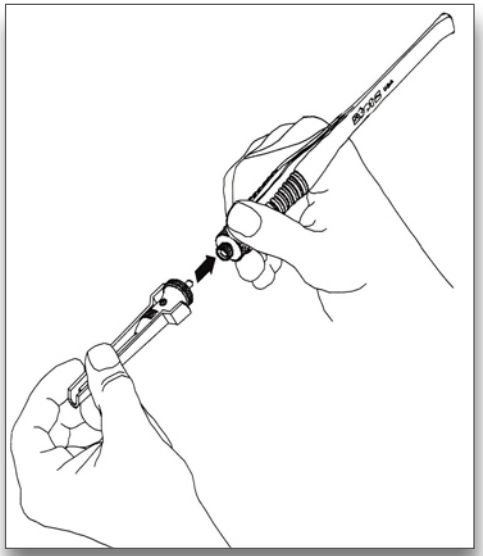
Vitreoretinal Instruments

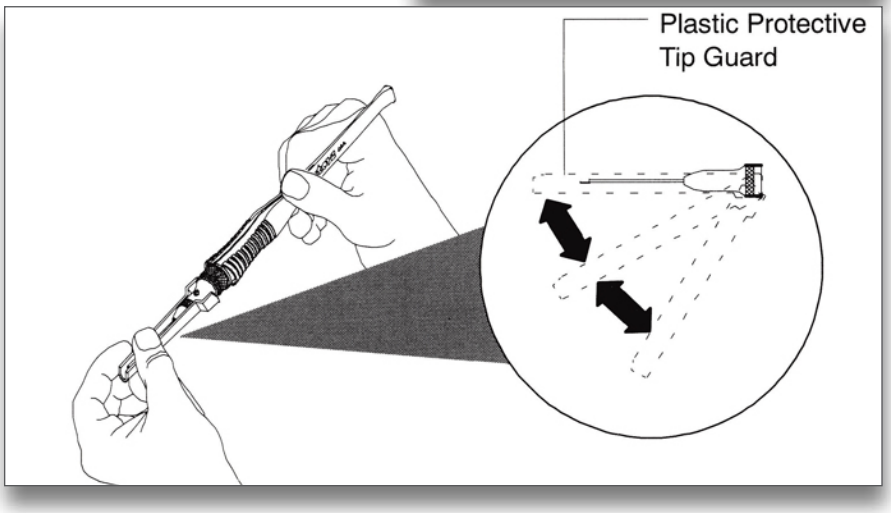
- The system consists of a handle, a selection of color coded tips, a plastic tip guard, and a cleaning adapter
- The handle features a rotation knob which allows the tip to be conveniently adjusted into optimal alignment
- The actuation mechanism locks the tip position as it actuates the tip

Vitreoretinal Instruments

Preparation for Use:

- With the plastic protective tip guard in place, hold the rotation knob firmly to stop rotation and securely attach the tip to the handle by threading the tip clockwise on to the handle
- Remove the plastic protective tip guard by grasping the guard at the tip end and pulling it downward from the tip toward the handle





Vitreoretinal Instruments

Disassembly of Instrument:

- Hold the rotation knob firmly to stop rotation of the handle, and unscrew the tip by turning counterclockwise being careful to protect the tip from damage
- Install tip guard to ensure tip is adequately protected

Vitreoretinal Instruments

Cleaning:

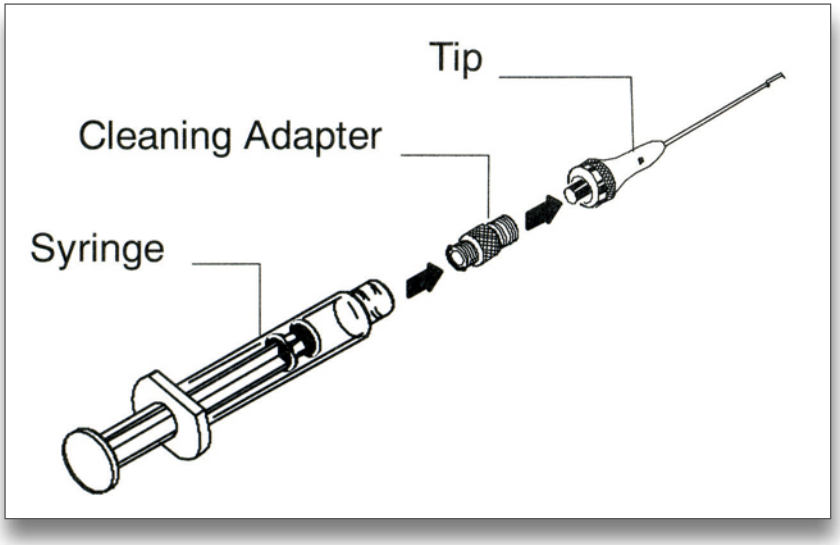
A. Remove blood, saline, tissue, and other contaminants immediately by rinsing with warm (30°C-40°C; 86°F-104°F) distilled or de-ionized water. Tissue and other residue can be gently removed using an instrument cloth or sponge
B. Rinse instrument thoroughly with warm (30°C-40°C; 86°F-104°F) distilled or de-ionized water
C. Disassemble the instrument to flush out tip
D. Fill a 60cc syringe with warm distilled or de-ionized water

Vitreoretinal Instruments

Cleaning:

E. Secure the cleaning adapter onto the Luer connector of the syringe and screw the instrument tip onto the cleaning adapter

F. Force the water through the tip being careful to never draw fluid into the tip



G. Repeat steps D through F once

H. Dry the instrument tips and handle thoroughly with micro filtered forced air or electric dryer

Vitreoretinal Instruments

Sterilization:

- Standard Gravity Steam Sterilization
  - Place the disassembled handpiece and instrument tip in a clean open tray, wrapped
  - Sterilize for 30 minutes at 121°C (250°F)
- High Vacuum Sterilization
  - Place the disassembled, wrapped handpiece and instrument tip in a clean open tray
  - Sterilize for a minimum of 3 minutes at 134°C, -0°C/+3°C (274°F)

Vitreoretinal Instruments

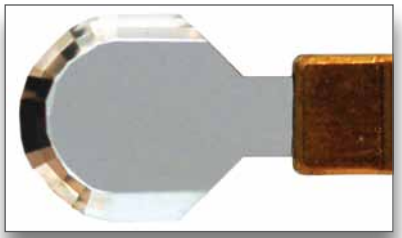
Sterilization:

- Flash sterilization
  - Place the unwrapped but covered, disassembled handpiece and instrument tip in a clean open tray
  - Sterilize for 10 minutes at 132°C (270°F)
  - Consult ANSI/AAMI ST79 and your institution's policies for restrictions regarding the use of flash sterilization
  - CAUTION: continued processing under high temperature sterilization conditions may shorten the useful life of the instrument

CAUTION: Allow the instrument assembly to cool at least 20 minutes before handling

Diamond Knives

- Diamond is a hard and brittle material.
- The edge on the blade is extremely sharp and is easily damaged by non-biological materials such as other instruments, countertops and cleaning materials or devices.

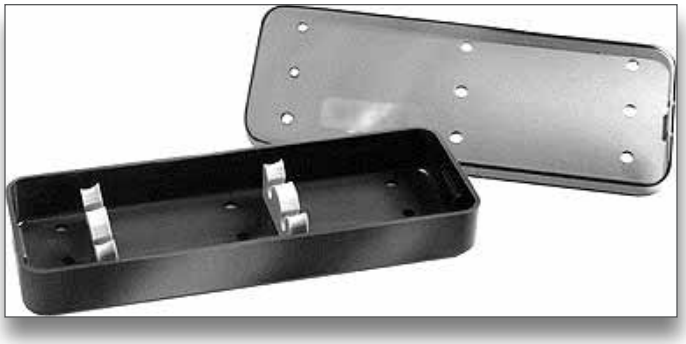


Angled Crescent Blade

- It is always good practice to retract the blade back into the handle prior to laying the knife on the mayo stand or in the instrument tray.
- This will protect the diamond blade from rolling on the stand or contacting other instruments and damaging the diamond blade.

Diamond Knives

- Always keep diamond knives in a separate sterilizing tray to keep the knife away from other instruments that could potentially damage the delicate footplates
- A tray like the Dual Knife Tray is inexpensive and durable
- In-service your entire staff on the value of the diamond knife
  - Explain the repair costs of a chipped blade or rusted internal mechanism to give your staff a better understanding of the importance of taking care of the instrument.
  - Diamond Blades never dull – they become dirty or chipped which gives the feel of a dull blade



Diamond Knife Sterilizing Tray
2 knives

Diamond Knives

Rinsing:

- Rinse the diamond knife immediately after surgery with distilled or de-ionized water to remove all debris - tissue, blood, balanced salt solution (BSS) and viscoelastic
- Rinsing with saline or BSS can cause corrosion of the metal components
- When knives are not rinsed properly, a build-up of foreign material collects on the blade
- Sterilization the debris onto the surface of the blade, causing it to drag through tissue

Diamond Knives

Usually ultrasonic cleaning is the method of choice for cleaning diamond knives, however follow the cleaning instructions of the device manufacturer.

- A 2.1-quart ultrasonic cleaner is ideal for cleaning delicate instruments
- Use distilled water in the ultrasonic cleaner for best results
- a neutral pH ultrasonic detergent is useful when the blade is extremely dirty

Diamond Knives

Using the ultrasonic cleaner:

- Dip the tip of the diamond knife, with the blade exposed, into the ultrasonic cleaner for 30 to 90 seconds
- Rinse the diamond knife with distilled water
- Dry the knife with compressed air or a hot air dryer, and retract the blade back into the handle

Diamond Knives

Cellulose Cleaning Block

- The cellulose block is more traumatic to the instrument than the ultrasonic cleaner
- Use a smooth vertical motion while stabbing the blade into the block to reduce the possibility of breaking the blade
- To incise the block, move the blade through the block advancing the cutting edge and not the blunt edge

Diamond Knives

When cleaning AVOID:

- Using a Styrofoam "peanut" or an eye sponge spear to clean the blade may cause chips or dings to the blade edge
- Avoid submersing the entire knife in the cleaner
  - Fluid forced into the mechanism and may cause corrosion and jamming
  - Clean the external aspects of the knife handle with an instrument wipe to prevent fluids from reaching the micrometer of the knife through submersion

Diamond Knives

Sterilization:

- It is best to use a steam autoclave to sterilize the diamond knife.
- Always retract the blade back into the handle prior to sterilization.
- DO NOT use dry-heat sterilization.

Diamond Knives

Sterilization:

- Avoid chemical sterilization as these chemicals can deposit in the handle causing corrosion, or can harm the bond between the diamond blade and the mount.
- These materials may also become trapped inside the handle and could come out during the procedure.

Diamond Knives

Sterilization Cycles:

- High-speed (flash) autoclave: 270°F (132°C) for 10 minutes, unwrapped.
  - *This method should be reserved for emergencies only. Consult AAMI ST79 and your institution's policies for restrictions regarding the use of flash sterilization.*
- Standard Gravity Autoclave: 250°F (121°C) for 30 minutes, wrapped.
- Prevacuum high temperature autoclave: 274°F (134°C) for 3 minutes, wrapped.

Note: These cycles have been validated for Bausch + Lomb Storz® Instruments Diamond Knives.

Problem Solving

Many problems can be traced to:

- Exposure to improper solutions and elements in the operating room
- Improper handling or abuse
- Inadequate cleaning, improper rinsing and drying immediately after use
- Use of tap water rather than demineralized distilled water
- Improper pH detergents
- Poor lubrication
- Water quality
- A faulty autoclave, improperly maintained equipment or mechanical changes in hospital piping or supply

Problem Solving

Spotting

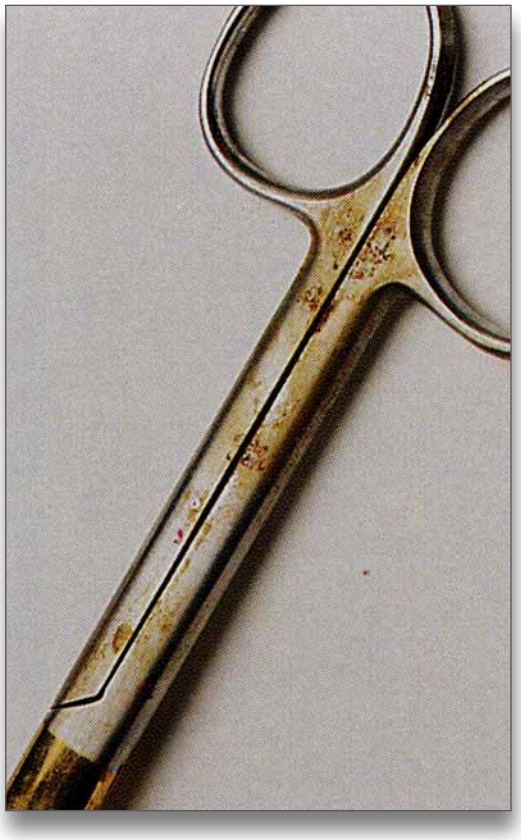
- Light-colored spots
  - Caused by droplets of water condensing on instrument and evaporating slowly
  - Can be traced to mineral content of water, usually sodium, calcium and magnesium
  - Usually caused by improper drying at the end of the autoclave cycle
    - Do not open door until all steam is exhausted
    - Check for a leaky gasket or valve causing water droplets to condense

- Dark-colored spots
  - Same condensation problem as light-colored spots
    - Not using distilled and demineralized water for cleaning, disinfecting, rinsing and sterilization. pH values should be near neutral (7.0)

Problem Solving

Spotting

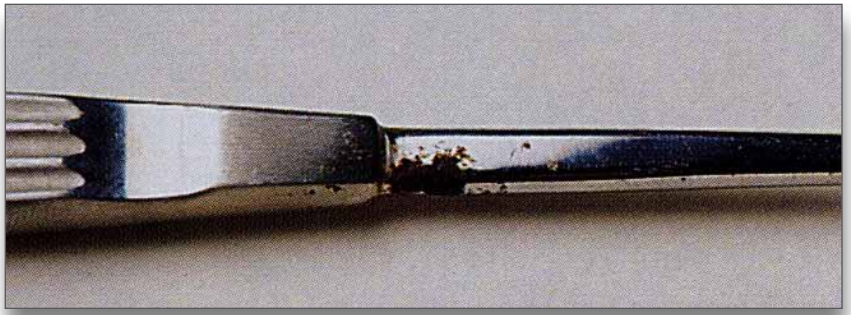
- Rust-colored film
  - Caused by foreign matter left inside new pipes during installation in an existing or new hospital
  - Water softening equipment or compounds which can leave a dust-like, rust-colored film
  - High iron content in the water supply
    - The problem is difficult to immediately rectify. Consult with the Engineering Department. A steam filter may help.
    - Problem usually temporary, subsiding in two or three months
    - Precautions to keep rusted instruments out of sterilization trays are essential to keeping their deposits off other instruments or the tray



Problem Solving

Spotting

- Corrosion (Rust)
  - Caused by debris left in hard-to-clean areas of instruments, excessive moisture inside sterile wrapped packs or chemicals in linens
    - Be careful cleaning instruments
    - Be careful in utilization of the sterilizer, such as preheating sterilizer, making sure steam at the end of the cycle is evacuated, making sure instruments are completely dry
    - Check valves and gaskets for leaks. Check local water supply. Consider filtration and regularly clean impurities from inside the sterilizer
    - Use demineralized water, including rinsing linens if necessary



Problem Solving

Stains

- Purple-black stains
  - Caused by exposure to ammonia or amine chemicals in steam lines
    - Rinse instruments thoroughly in distilled water and avoid using any detergents containing ammonia
    - If problem persists, check if chemicals containing amines have been used to clean lime from the steam lines
    - Use distilled or demineralized water instead of local water to cycle through the autoclave
  - Caused by exposure to saline, blood, potassium chloride or other chemicals
    - Rinse instruments as soon as possible after exposure
    - Proper cleaning and rinsing helps avoid stains

Problem Solving

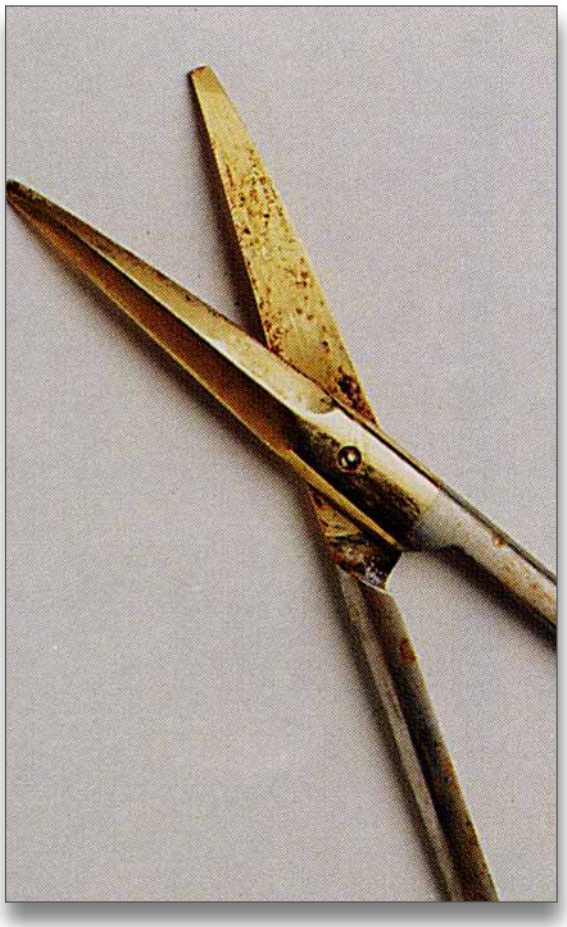
Stains

- Purple-black stains
  - Detergents can cause staining
    - If a detergent contains a chloride or has a high pH (over 8.5), steam can create an acid in the autoclave.
    - Passivation will be removed and stains or pitting can occur
    - Avoid detergents with contents which will react with steam and use only neutral pH detergents
  - Caused by cleaning instruments of dissimilar metals together ultrasonically
    - Separate instruments during cleaning prior to ultrasonic cleaning

Problem Solving

Rust (Rust Deposits)

- Often caused by sterilizing stainless steel and plated instruments together
- If plating is imperfect, there will be an electrolytic action with carbon particles transferring from exposed metal to the stainless steel. These particles oxidize.
    - Separate instruments
    - Carefully inspect plated instruments, sending those with exposed metal for replating or replace them with stainless steel
    - Tap water rinsing may cause ferric deposits due to iron content in local water
    - Rinsing with demineralized distilled water is the solution



Problem Solving

Rust (Rust Deposits)

- Once there is rusting or pitting of a surgical instrument, it is even more susceptible to additional deterioration and potential reaction to other instruments
- Rust cannot be rinsed away
- Restoration is difficult
- Replacement is advised

Problem Solving

Stain Removers

- Always check with the manufacturer before employing a stain remover
- Some removers are highly acidic and can cause surface damage to instrument which promotes pitting and rusting

Problem Solving

Tarnish

- Consult with manufacturer of instruments with sterling silver content about tarnish removers
- One means to remove tarnish is to place the instruments in simmering water containing a few tablespoons of baking soda and a loosely crumpled piece of aluminum foil – The tarnish transfers to the foil
- Regardless of method, always rinse the cleaned instruments with distilled water
- If tarnish remains, instruments may need to be commercially buffed or reprocessed by the manufacturer

Problem Solving

Demagnetizing Instruments

- Some delicate microsurgical and ophthalmic instruments become magnetized over a period of time
- Usually occurs because instruments of dissimilar metals are mixed and constantly touching or rubbing together
- Prevention requires segregation of these instruments by type of metal, separate wrapping or containers and inserts to separate the instruments
- Check with manufacturer about demagnetizing instruments
- There are also demagnetizers available

Problem Solving

- Instrument I.D. Systems
  - Color coding can identify instruments or sets by procedure, department, or surgeon
  - Colored marking tape must be validated by the manufacturer for sterilant penetration
    - Tape can crack, peel, or flake off into wounds, or harbor microorganisms causing infection. It is essential to inspect tape and remove and replace when necessary
  - A color coating can fused permanently onto instrument handles or rings
  - Instrument shanks can be etched on new or old instruments
    - Vibration or impact etching can damage instruments causing premature failure

Problem Solving

Wear/Breakage

- Worn, broken instruments can cause significant problems if not identified during inspection and testing
  - Can affect other instruments detrimentally during the cleaning/sterilizing processes
  - Can cause everything from tissue trauma to non-performance at critical points in a surgical procedure
- Identify problem instruments early
- Separate unacceptable instruments from other instruments and tag them for replacement or repair
- Proper maintenance and appropriate use will prolong the life of an instrument, but all instruments wear out eventually

Problem Solving

- Instrument repair, when possible, represents a significant cost savings over replacement
- Selection of a credible repair source is essential
- Your instrument supplier may offer special instrument maintenance programs

Post-Test

Thank you for completing the educational material for Effective Management of Surgical Instruments. Click the link below to take the post-test and receive your continuing education certificate.

www.StorzOphthalmicCE.com

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Developed with an unrestricted educational grant from: BAUSCH + LOMB storz® Ophthalmics