INSTRUMENT INSPECTION



CIS Self-Study Lesson Plan

Lesson No. CIS 245 (Instrument Continuing Education - ICE)

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LEARNING OBJECTIVES

1. Stress the importance of inspecting surgical instrumentation in compliance with the manufacturer's instructions before assembling instruments into sets
2. Explain when and how to test instruments for organic/detergent residuals
3. Describe basic inspection procedures required for all surgical instruments to check for cleanliness, stains, corrosion, cracks, and breakage, and stiffness of movable parts
4. Discuss techniques to inspect common instruments:
   - Scissors
   - Insert tips on various instruments
   - Ratchets
   - Rongeurs
   - Bone cutters
   - Bone curette
   - Chisels and osteotomes

Instrument Continuing Education (ICE) lessons provide members with ongoing education in the complex and ever-changing area of surgical instrument care and handling. These lessons are designed for CIS technicians, but can be of value to any CRCST technician who works with surgical instrumentation.

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SURGICAL INSTRUMENTS MUST BE INSPECTED FOR CLEANLINESS and proper functioning before they are placed in sets for use in surgical and other procedures. Those that are not functioning properly or that are not clean can cause serious issues for patients and surgical staff. Instrument inspection is a multi-step process that begins with determining if an instrument is clean, structurally intact and properly functioning. This lesson reviews common inspection steps for all instruments and specific procedures for frequently used instruments.

OBJECTIVE 1: STRESS THE IMPORTANCE OF INSPECTING SURGICAL INSTRUMENTATION IN COMPLIANCE WITH THE MANUFACTURER'S INSTRUCTIONS BEFORE ASSEMBLING INSTRUMENTS INTO SETS

Surgical instruments that are not properly cleaned can create serious problems if they are used. For example, debris remaining on a surgical instrument can cause an adverse reaction if a patient is exposed to it. Granulomas can develop from small particles of debris that enter the surgical site when the patient's immune system attacks the debris particles that fall from the instrument.

Another cause of granulomas arises when a stress fracture on an instrument causes it to break during use, and a portion of the instrument drops in the surgical site. In both instances, since the body's immune system cannot eliminate the debris, it walls off the substance in an attempt to prevent the debris from causing harm. Granulomas can grow over time, cause pain and discomfort and, sometimes, require surgical removal.

Improperly cleaned instruments may not be effectively sterilized. If debris is baked onto an instrument's surface, it can provide protection during sterilization to any bacteria under the debris. If the debris is dislodged during surgery, the patient may develop an infection when the bacteria enter the surgical site.

Instruments that malfunction create challenges for the surgical team as replacements must be located and transferred to the surgical suite. Any of the situations just described might result in the patient needing additional treatment including antibiotic therapy or further surgery that could have been avoided if proper instrument inspection had preceded placement in the instrument set and sterilization.

Careful attention to the manufacturer's Instructions for Use (IFU) for surgical instrumentation is required because they explain necessary cleaning and inspecting procedures. If the IFU are not consistently and carefully followed, bioburden may be left on or in the instruments.

Depending on each instrument's features, magnification might be required for inspection. A lighted magnifying glass or telescope can be used to determine if small discolorations are actually debris that was not removed by the cleaning process. Meticulous attention to the IFU will help to minimize any possibility that debris or bioburden remains on the instrument after cleaning.

OBJECTIVE 2: EXPLAIN WHEN AND HOW TO TEST INSTRUMENTS FOR ORGANIC/DETERGENT RESIDUALS

The validated cleaning process developed by the washing equipment and instrument manufacturers should be verified periodically to ensure the process is effective. Non-routine testing may also be useful to evaluate the effectiveness of training programs. Poor results will indicate that applicable employees need

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retraining and/or additional practice to correctly undertake the cleaning process. Special instrument testing may also be important after equipment is repaired and before it is returned to service.

Basic tactics for special instrument testing include selecting a representative number of instruments that will be checked for soil residuals. Those chosen should be difficult to clean, and results should be recorded for quality assurance purposes.

Each department or facility must determine the frequency and type of testing and the number of instruments to be tested. Decisions should be based on the volume and type of instrumentation processed and types of soil expected

- CLEANLINESS
- STAINS
- CORROSION
- CRACKS
- BREAKAGE
- STIFFNESS OF MOVING PARTS

to be found on the instruments. Any positive result must be investigated. The test solution must be removed from the instruments' surfaces after testing is complete as part of the re-cleaning process, and the applicator used for the test solutions should be disposed of in a biohazard container.

Two basic types of tests can be used to determine if instrument surfaces are free of detergent residuals and inorganic and organic soils.

The first basic type uses a swab or test strip that is exposed to the surface of the device being tested. Note: different swabs or test strips are specific for different types of soil such as protein, blood or carbohydrates. A swab is moistened with sterile or tap water and is wiped on the surface of the device being tested. If the test substance is not on the surface of the instrument being tested, the swab will remain its original color. If the test substance is present on the instrument's surface, the swab will turn a different color to indicate the instrument is not clean and must be re-cleaned before being placed in a set.

A variation of the swab or test strip method involves use of a vial of test solution. Swab surfaces on all areas of the instrument with a dry cotton applicator dampened with tap or sterile water, and place the tip of the swab in the test solution. If the solution turns color it indicates that a residual of the type of soil being tested is present, and the cleaning process should be studied and corrected, as necessary.

There are test devices available for testing general instruments, lumens, flexible endoscopes, and robotic devices. Gloves should be worn when testing for proteins.

The second basic type of test used to check instruments for detergent residuals and inorganic and organic soils involves analysis for adenosine triphosphate (ATP). ATP is a substance present in

all life and, therefore, will be present in any organic debris present on the instruments. Living and growing cells continue to produce ATP but, when the cells die, the concentration of ATP will decrease over time. When ATP is used as a cleaning indicator, the cleaning process must begin as quickly as possible after contamination occurs. Prolonged times between contamination and cleaning can result in the death of cells and a lessened concentration of ATP, even though contamination remains.

ATP testing is similar to the swab approach described above. A swab is dipped in a solution of luceferin-luciferase and is wiped on the instrument's surface. If the chemical reacts to ATP that is present, a bioluminence is created and can be read by a test device. Depending on the test device used, a level can be set for pass, caution or fail ranges. Note: ATP does not correlate to the presence of bacteria colonies and cannot be used to determine if microbial levels are low enough for sterilization to occur.

OBJECTIVE 3: DESCRIBE BASIC INSPECTION PROCEDURES REQUIRED FOR ALL SURGICAL INSTRUMENTS TO CHECK FOR CLEANLINESS, STAINS, CORROSION, CRACKS, BREAKAGE, AND STIFFNESS OF MOVABLE PARTS

All surgical instruments must be inspected for cleanliness, stains, corrosion, cracks, breakage, and stiffness of movable parts before being placed in instrument sets. If possible, instruments should be checked under magnification because small pieces of bioburden or debris can otherwise be difficult to see. Special telescopic magnification devices can be used to check cannulas and lumens. Careful attention should be paid to instrument handles, serrations, box locks or hinges, cannulas or lumens, and instrument teeth. Each of these features can harbor small amounts of debris or bioburden.

A variety of stains can be found on an instrument's surface. Brown or orange stains can be caused by high pH surface deposits being baked on to the instrument during a thermal rinse or sterilization. These deposits can be from blood that was not properly removed during initial cleaning or from cleaning solutions, such as chlorohexidine, some soaps and detergents, and glutaraldehyde, that were not adequately rinsed off the instrument. Dark brown or black stains are caused by exposure to low pH solutions, such as some detergents and/or dried blood. These types of stains can be prevented by rinsing with purified water. Note: the facility's purified water system should be checked if these stains occur.

Slow evaporation of rinse water can cause light or dark "water" spots to form and remain on instrument surfaces because of minerals in the water. A purified water rinse and machine or hand drying will help to reduce these spots. Bluish black stains can be caused by washing or sterilizing instruments made of different metals when they come in contact with each other. This is especially true of plated instruments. The hot and moist environment of an instrument washer can create an electrolytic reaction that can cause a stain color reaction. For example, the plating on one instrument can be removed and then be re-plated onto a different surface. Bluish black stains can also be caused by exposure to chlorides found in blood, saline and potassium chloride. Exposure to chlorides can also cause corrosion and pitting.

If stains are identified before exposure to high heat, it may be possible to remove them. Rust, however, will permanently damage an instrument's surface and can cause pitting. A pencil eraser can be used to determine if a brown/orange area is a stain or rust by rubbing it over the surface of the stain. If the stain comes off and the underneath surface is undamaged, it is a stain.

If the underneath surface is pitted, the discoloration is rust. Instruments with rust or pitting should be removed from service for repair or be discarded because continued use will increase surface damage. Pitting also provides a place for bacteria and debris to collect, which makes their removal more difficult.

The entire instrument surface must be inspected to ensure there are no fine cracks or small breaks. Small cracks can cause instrument malfunctions, and a portion of an instrument could be lost inside a surgical wound if the crack breaks during surgery. Instruments containing cracks should be discarded.

All movable parts on instruments must be checked as part of the inspection process. Instrument tips must be inspected to ensure they are not broken and function correctly. Stiff parts should be lubricated, and it may be necessary to operate joints until they move freely. If problems persist, the instrument should be repaired or replaced.

OBJECTIVE 4: DISCUSS TECHNIQUES TO INSPECT COMMON TYPES OF INSTRUMENTS

After basic inspection processes are completed, specific features of each instrument should be checked to ensure it is functioning properly. For example, many instruments must be sharp. General hand-held scissors can be tested by using test material sold by many companies. Cut the test material and ensure that at least three-fourths of the blade can cut completely through the material without the material snagging. Note: do not place the material completely to the back of the blade because full opening of the blade may damage the instrument. A snagging or uneven cut indicates the scissors must be sharpened.

Laparoscopic scissors may be tested by cutting a single layer of facial tissue, without snagging of the cut fabric. Cervical biopsy punches can also be tested with facial tissue: they should cut through two layers of facial tissue without any snagging or tearing. Bandage scissors can be tested by cutting through a surgical towel. The towel should not pinch or snag during the cutting process. All scissors should be visually inspected to ensure the blades meet.

The sharpness of several different instruments, including osteotomes, curettes and gouges, can be tested by using a plastic dowel. Place the osteotome at a 45° degree angle to the dowel and move the instrument along the dowel's surface to confirm it bites into it. Move the cutting edge of a curette along the surface of the dowel; the sharpened edge should cut into it and remove a piece. When held at a 45° degree angle, the gouge should penetrate into the dowel's surface.

Rongeurs of various types can be tested for sharpness by observing that their jaws cut cleanly through an index card. Pituitary rongeurs should make a firm and even imprint on the index card. Bone and pin cutters and nail nippers can be tested by confirming that ¾ of their blade cut cleanly through an index card. Some arthroscopy punches can be tested by cutting a thin single layer of leather without tearing or snagging.

Instrument ratchets can be tested by closing the ratchet on the first ratchet tooth. While holding the instrument's blade, lightly tap the ring handle where the ratchet is located on a flat surface. The ratchet should stay closed. If the ratchet springs open or disengages, repair is needed.

Instrument inserts should be visually inspected to ensure they are not worn, cracked, or loose and they should be replaced if they are.

Tissue and dressing forceps should be visually inspected to ensure the blades are aligned and teeth, if any, are not broken. The forceps blades should close completely and spring open when released. As always, IFU must be carefully followed as each instrument is inspected.

IN CONCLUSION

Instruments must be properly cleaned and inspected in detail to ensure proper functioning prior to sterilization before use in surgical procedures. Failure to detect a problem with an instrument can cause serious problems during the procedure and possible harm to the patient. Certified Instrument Specialist technicians must ensure that the necessary time is taken to ensure that the surgeon and surgical team have acceptable tools to perform the surgery.

REFERENCES

1. International Association of Healthcare Central Service Materiel Management. Central Service Technical Manual. 2007 (pp. 175 – 101).
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