Inspection and Testing of Non-Powered Handheld Surgical Instruments

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LEARNING OBJECTIVES
1. Identify different types of handheld surgical instruments
2. Address cleanliness inspection processes for handheld surgical instruments
3. Review the processes for testing handheld surgical instruments

Surgical instrument inspection and testing are among the most critical tasks performed by Sterile Processing (SP) technicians. Not only are they important for providing sterile, functional instruments to the end users each time they are needed, but they also affect patient safety. Soil left on instruments causes the devices to be unsterile after sterilization (one cannot sterilize what is not clean), and damaged instruments can harm a patient by not properly grasping tissue or holding a needle, to name just a couple of examples. Additionally, dull instruments will not cut well, causing unnecessary tissue damage and increasing the patient's discomfort and recovery time.

There are three general categories of surgical instruments and equipment: non-powered handheld, powered and endoscopic. This lesson explores inspection and testing recommendations for non-powered handheld instruments.

Objective 1: Identify different types of handheld surgical instruments

Non-powered handheld surgical instruments are used in nearly every procedure and facilitate grasping, cutting, retracting, clamping and chiseling. Each type of handheld instrument is designed to perform a specific function and has its own recommendations for proper inspection and testing. The list below addresses common types of handheld instruments and their uses.

Clamps

Clamps (hemostats) are used to control blood flow and are supplied in a variety of sizes, from small ones, such as mosquito clamps, to large varieties, like Crile clamps. Occluding clamps are atraumatic varieties that prevent tissue damage. A typical application would be a blood vessel or bowel tissue that was intended to be reanastomosed (reunited) during surgery.

Cutting instruments
Scalpel blades, scissors, chisels and osteotomes are examples of cutting instruments. They range from very delicate scissors intended for surgery of the eye or brain to chisels and osteotomes used to cut bone.

Retractors
Retractors are used to hold back tissue and permit better visualization into the surgical site; examples include the rake retractor and Richardson retractor.

Grasping instruments: Forceps
Forceps, commonly known as "pick-ups," are similar to tweezers and used to hold and manipulate tissue. Some have a single or double tooth at the end of the jaw. Grasping instruments' tips may be smooth or serrated.

Suction instruments
Suction instruments may be angled or straight and are used to suction blood and other fluids during surgery. Lumen diameters range from very small, used in spaces like the brain, to large diameters used in bigger spaces, such as the abdomen, where copious amounts of fluid are present.

Objective 2: Address cleanliness inspection processes for handheld surgical instruments
All surgical instruments, regardless of their type, should be inspected for retained debris, staining and corrosion. Lighted magnification should be used to inspect all devices, especially hard-to-clean areas, such as serrations and moveable mechanisms.

Instrument identification tape, coated devices, barcodes and radio frequency identification tags should all be inspected to ensure there is no wear. If tapes, coatings or tags are flaking, chipping, lifting or otherwise showing damage, the device should be removed from service and sent for repair or replaced. If an instrument is difficult to open and close, the hinge/box lock area is probably soiled and needs to be sent back to the decontamination area for proper cleaning.

Each instrument's instructions for use (IFU) should be consulted for specific cleaning inspection requirements, and the IFU for all cleaning solutions, equipment and tools should also be carefully and consistently followed. If any debris is found, the soiled instrument and all others in the same tray must be sent back to the decontamination area for proper cleaning. It is also possible that an instrument that appears free of debris to the naked eye may, in fact, not be clean. Cleaning verification (CV) tests should be performed according to the manufacturer's IFU and the facility's CV testing policy.

The following are key inspection area processes for handheld surgical instruments:

Clamps
Joints and serrations should be examined for debris and re-cleaned as necessary. All serrations, finger rings, ratchets, toothed areas and instrument shafts must be diligently checked for cleanliness.

Cutting instruments
Joints and instrument serrations should be examined for debris and re-cleaned as necessary. Check all shafts, ratches and finger rings for cleanliness and proper functionality. Instrument tips, cutting edges, curette cups and rasps should also be carefully inspected for debris and wear.

Retractors
Joints, shafts, finger rings, ratches, prongs and instrument serrations should be examined for debris and re-cleaned as necessary. If the retractor features multiple parts, each piece should be carefully checked for cleanliness and proper functionality.

Grasping instruments
All hinged areas, shafts, ratches and instrument tips should be checked for cleanliness.

Suction instruments
Use of a properly sized borescope is helpful when inspecting lumens. Check the suction tips, stylets and finger suction control hole carefully for debris.

Objective 3: Review the processes for testing handheld surgical instruments
Testing instruments for proper function is crucial to positive procedural outcomes. Non-functional instrumentation will, at the very least, cause a case delay while a functioning device is obtained and delivered to the procedural area. Improperly functioning instruments can also cause patient harm through tissue damage, increased recovery times and even infection. It is important to remember the following when testing surgical devices:

- ·Common areas where cracks may occur include the hinge/box lock and the base of the instrument jaws.
- Individual instrument manufacturer's IFU should provide instructions for testing their instruments' functionality. Follow the IFU carefully and inspect consistently and thoroughly to ensure each device functions as intended.
- Lubrication should be performed according to the device and lubricant manufacturers' IFU. *Note: Water-soluble lubricant is used when instruments are steam sterilized.*
- Instruments that do not pass inspection should be promply removed

from service and tagged for repair or discarded based on the facility's policies and procedures.

The following protocols should be used for these common handheld devices:

Scissors

Scissors should be tested for sharpness and cutting ability. Commercially prepared scissor test materials are available for this purpose and should be selected based on scissor size (and micro weight for micro scissors). Red scissor test material is used to test heavy scissors (4½ inches or longer), such as Mayo or suture scissors. Yellow test material is used to check the cutting ability of more delicate scissors (those measuring less than 4½ inches), such as Metzenbaum scissors.

The scissor tip is the area that is most likely to become dull. Scissors should be opened approximately two-thirds and placed over the testing material to be cut. Scissor blades should be able to cut through the test material to the tip, two to three times consecutively. The cut should be a smooth action and result in a clean edge. There should be no drag when the scissors are pulled away in the closed position.

To test scissors' operation, a drop test may be performed by opening the scissors fully, holding them upright and letting the upper half of the scissor go free. The upper half should fall approximately two-thirds closed, not drop loosely into a fully closed position. Scissor blades should be properly aligned and, when closed, the tips should have no visible space between them. Other specialty scissors may require special testing for function as detailed in their IFU.

Scissors can become dull when used inappropriately, such as when cutting suture with Metzenbaum scissors, which are intended for cutting tissue. Many scissors, including those used in ophthalmic and neurological surgeries, are extremely delicate, and inappropriate use is likely to result in impairment of the device's intended function.

If scissors are stiff, it is important to lubricate the hinge area. After applying the lubricant, open and close the scissors several times to help promote proper movement.

Needle holders

Needle holders or drivers are instruments designed to hold and guide a surgical needle so it does not slip or slide during suturing. Needle holders can be tested by placing a suture needle in the jaws and closing the needle holder on the second ratchet. The jaw serrations are the first place to show signs of wear. Serrations should hold the needle tightly; if they are worn, the serrations will allow the needle to twist during suturing. If the needle can be easily turned by hand, repair is needed. Damage can occur when a large needle is used in a delicate needle holder, causing the holder to lose its ability to grip smaller needles. Needle holders with tungsten jaws (identified by their gold handles) can have their worn jaws replaced.

Additional testing includes closing the jaws and holding them to a light (light should not shine through the closed jaws). A drop test may also be performed. The jaws should be opened fully, with the upper half allowed to drop free. As with scissors, the upper half should fall approximately two-thirds closed, not slam into the closed position. Locks must be tested to ensure the needle holder remains in the closed position. Close the clamp on the first ratchet and tap both rings of the handle on a flat surface. If the device springs open, damaged ratchet teeth, poor alignment or poor shank tension are the likely cause. Lubricate needle holders as needed.

Clamps

Clamps should function without being wobbly or dragging. Testing for wobbling can be accomplished by holding the ring handles in both hands and opening the clamp. Excessive play in the box lock is a sign that the instrument needs repair. Jaw alignment can be tested by closing the clamp and holding it to the light. As with needle holders, light should not shine through the jaws; if light is visible through the jaws, it indicates misalignment.

A clamp's ratchets should close easily, hold tightly and not snap open. Ratchets may be tested by closing the clamp on the first ratchet and tapping both rings of the handle on a flat surface. If the clamp springs open, damaged ratchet teeth, poor alignment or poor shank tension are the likely cause. A clamp that does not hold securely or has misaligned jaws can damage tissue and lose its ability to occlude (close) a bleeding vessel. Both sides of the box lock should be checked for hairline cracks.

Specialty clamps are used for grasping and holding vessels and tissue without trauma or injury. The jaws should close with a spring-like mechanism, the serrations should engage each other completely, and the ratchet must be in alignment when closed. Testing is accomplished by closing the clamp on the first ratchet (the jaws should not be touching). When closing all ratchets, the jaws should close evenly. Atraumatic teeth (i.e., jaws) can be tested by closing the teeth over a plastic zip-top bag. When the clamp is removed, the jaw impression should be visible but the bag should not be perforated.

It is helpful to standardize instrument patterns within sets. Variations by manufacturer in clamp length and curvature (each intended for similar

purposes) can frustrate surgeons who may not anticipate a variation in performance during surgery.

Rake-type retractors

Rake retractors should be examined and tested for sharpness, burrs and surface corrosion. Proper prong alignment is also important. When prongs are misaligned, tissue retraction becomes uneven and can result in unintended tissue damage. Burrs may also cause tissue damage.

Thumb forceps

Thumb forceps, also called tissue forceps, are used to hold and manipulate tissue. Thumb forceps are divided into two general types: toothed forceps that permit a more secure grasp and non-toothed dissecting forceps that gently grasp tissue, allowing for tissue preservation. Toothed forceps should mesh perfectly upon closure and open smoothly when the pressure is released. Any sluggishness indicates tooth misalignment. Teeth should be inspected to determine sharpness, continuity in size, and symmetry. If any teeth are dull, damaged or inconsistent in size, the forceps should be removed from service and sent for repair. Non-toothed forceps should be closed, with the tip observed for overlap. Non-toothed forceps that do not align perfectly should also be removed from service and tagged for repair.

Rongeurs, curettes and chisels

Rongeurs are used to remove small pieces of bone as well as round and smooth fractured bones. Rongeurs may be single- or double-action. The difference between the two is jaw closure on the double-action rongeur. Handles are squeezed, creating a double action for the jaws to close and also reducing the hand strength necessary to operate the instrument. Jaws are the primary inspection area for these devices. Dents or gouges in the jaw can cause the instrument to cut in an unintended manner.

A rongeur may be tested by cutting a business card (or card stock of similar weight) with three cuts. The test material should cut smoothly, without tearing, and the cutting edges must not have lateral movement. Kerrison and laminectomy rongeurs are used to cut small amounts of bone, often in more limited bodily spaces like the spine. Because of the potential for debris to be retained at the cutting edge, careful inspection under magnification is recommended. Rongeurs should be professionally sharpened at defined intervals.

Curettes and chisels are designed to remove tissue or bone by scraping. Curettes are cup shaped; chisels have a straight edge. The cutting edges of these instruments should be sharp. Upon inspection, no debris should appear in the curette cup, and the profile should be intact and clean. Cutting surfaces of curettes and chisels should be free of nicks and burrs. Curette and chisel sharpness may be tested by using a plastic dowel. Place the instrument at a 45-degree angle to the dowel and move the cutting edge along the surface of the dowel. The edge should cut into the dowel and remove a piece of it.

Sharp instruments, such as scissors, osteotomes, curettes and chisels, should be tested for sharpness. There should be no dents, nicks or chips in the sharp edges. Delicate knives, keratomes and rongeurs can be tested for burrs and rough edges by passing them through a kidskin cloth. If a drag is noted, the edge is rough or has a burr and the insturment should be tagged for repair.

Retractors

Retractors are used to move tissue to one side to permit visualization of the operative site. Retractors may be handheld or self-retaining. Self-retaining retractors use a mechanical action to keep them open during retraction. To test a self-retaining retractor, push down on the lever and release. Handheld retractors do not have moving parts. They should be smooth and free of dents and surface corrosion. If the lever fails to spring upward or release, the retractor is not in proper working condition and should be removed from service and tagged for repair.

Suction devices

Suction devices are used to suction fluids, primarily blood. They come in single-use disposable or reusable varieties. Single-use disposable suctions are preferred, because suction devices are difficult to clean. Further, the inner lumen cannot be visualized with the naked eye, making it difficult to ensure cleanliness. For reusable suction devices, a borescope or endoscopic camera should be used to visualize internal lumens and inspect for debris and defects in the lumen wall.

Conclusion

Surgical instruments that function as intended and are free from pathogenic microorganisms are critical to positive surgical outcomes. Personnel who use, care for or handle surgical instruments share responsibility for delivering instruments that are safe for patient use. This includes the surgeon, scrub technician, personnel who transport instruments and technicians who process them.

Well-made surgical instruments are a significant financial investment and can last 10 or more years if cared for and handled properly. This includes following instrument manufacturers' IFU, using instruments only for their intended purpose, providing

proper point-of-use treatment (including keeping contaminated instruments moist until they are processed and transporting them to the decontamination area safely and promptly following the procedure), and carefully and properly inspecting and testing each device for cleanliness and functionality. C