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Thoracic Surgery and Instrumentation

LEARNING OBJECTIVES

1. Review the anatomy of the thoracic cavity
2. List common diseases and thoracic procedures
3. Identify thoracic instruments and their function
4. Explain processing procedures for thoracic instrumentation

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.

Earn Continuing Education Credits:

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INSTRUMENTS USED FOR THORACIC SURGERY MAY BE VERY DELICATE or quite heavy and sturdy. Thoracic instruments usually need to be processed as soon as they are received in the Central Service (CS) department because these sets are often needed in case carts for cardiovascular and thoracic emergencies. Knowing how to identify and process these specialty instruments properly and quickly is important to ensure that clean, sterile and well-functioning instruments are available whenever they are needed.

OBJECTIVE 1: REVIEW THE ANATOMY OF THE THORACIC CAVITY

Thoracic surgery involves procedures performed in the thoracic cavity (chest) and is performed by cardiovascular or thoracic surgeons. The thoracic cavity contains the thorax, trachea, esophagus, bronchial tree and lungs.

The thorax includes the sternum, thoracic vertebrae, twelve ribs, the mediastinum and pleura (membrane that covers the lungs). The trachea extends from the larynx to the bronchi and functions as the passageway for air to travel to and from the lungs. The esophagus is a muscular tube that conveys food from the pharynx at the back of the mouth to the stomach. The bronchial tree divides at the carina (part of the trachea) into the right and left bronchi, and enters the lungs. The lungs are the principle parts of the respiratory system and extend from just slightly below the clavicle (collar bone) to the diaphragm. The right lung contains three lobes and the left lung contains two.

OBJECTIVE 2: LIST COMMON DISEASES AND THORACIC PROCEDURES

The most common medical conditions requiring thoracic surgery include lung cancer, chest trauma, esophageal cancer, emphysema, thoracic aortic aneurysm and lung transplantation. Surgical procedures for the treatment of lung disorders require thoracotomy (open chest).

In addition to radiologic testing, procedures used to diagnose conditions of the thoracic cavity include bronchoscopy, mediastinoscopy, thoracoscopy and thoracentesis. Bronchoscopy is a technique used to visualize the inside of the airways for diagnostic and therapeutic purposes, and may be performed with a flexible or rigid bronchoscope. Mediastinoscopy is performed as a follow up when a computed tomography (CT) scan shows a lesion. Thoracoscopy is an endoscopic procedure used to examine the thoracic cavity. Thoracentesis involves the placement of a needle into the pleural



Figure 1: Satinsky Vena Cava Clamp



Figure 2: Allison Lung Retractor

space for the analysis of pleural fluid.

Lung cancer is the leading cancer killer in the U.S. for both men and women, and accounts for approximately 27% of all cancer deaths. Primary lung tumors are divided into four major subgroups: small cell carcinoma, squamous cell carcinoma, adenocarcinoma and large carcinoma.

Chest trauma involves injury to the chest wall and its underlying structures, and may be caused by blunt or penetrating force. Blunt chest injuries are usually the result of motor vehicle accidents and falls, whereas, firearms and knives are often involved in penetrating injuries. Pneumothorax (collapsed lung) is common in chest trauma, a medical emergency that involves the insertion of a chest tube.

Esophageal cancer is more common in men than women and is often caused by excessive alcohol and tobacco use, as well as obesity. Invasive, endoscopic and robotic procedures can be performed to treat this condition.

Emphysema is a chronic, progressive disease – typically caused by smoking – that breaks down the walls of the alveoli (air sacs) in the lungs and makes breathing difficult. The alveoli enlarge, trapping oxygen and causing shortness of breath. Lung volume reduction surgery

(LVRS) is a procedure that removes approximately 20-35% of the poorly functioning lung tissue from each lung; this makes breathing easier and improves the patient's quality of life.

Thoracic aortic aneurysm (TAA) is a stretched and bulging section in the wall of the aorta. The aorta is the largest artery in the body and carries blood from the heart to the rest of the body. The aneurysm can be surgically removed and replaced with a graft of artificial material.

Lung transplantation involves removal of one or both diseased lungs and replaces the organs with healthy lungs from a human donor. Lung transplantation can improve breathing and may prolong life; however, transplantation involves major risks, and complications are common.

OBJECTIVE 3: IDENTIFY THORACIC INSTRUMENTS AND THEIR FUNCTION

Instrument sets used for thoracic procedures are equipped with instrumentation needed to remove a rib and expose and repair the organs of the thorax. Thoracic procedures also require a major set with soft tissue instruments, as well as a major vascular set. Thoracic specific instruments include:

Potts-Smith Forceps - A two-bladed

instrument with serrated jaws that is used for compressing or grasping tissue in surgical procedures.

Sarot Bronchus Clamp - A nine-inch clamp with curved jaws that is used on the bronchus. This clamp features one jaw that is serrated longitudinally and another that has pins to give this clamp added stability and grasp, so it remains affixed throughout the procedure.

Satinsky Vena Cava Clamp - A 10¼-inch ratcheted, serrated, finger ring vascular clamp specifically designed for controlling blood flow in the vena cava vein. This clamp is also used in vascular and cardiovascular surgery, and may also be used on difficult-to-reach veins. This clamp can be identified by the DeBakey serrations and the modified ski jump shape of the jaws.

Davidson Scapula Retractor - A highly useful retractor used in thoracic surgical procedures. Its ribbed handle increases gripping, while the hooked blade allows for a stable hold on the scapula to give unobstructed access to the surgical field.

Bailey Rib Contractor - Two inward-facing, curved, clawed hands mounted on



Figure 3: Ryder Needle Holder

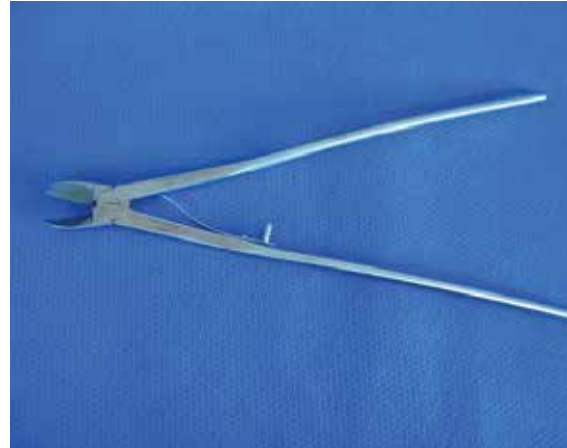


Figure 4: Bethune Rib Shears



Figure 5: Hemoclip Appliers

a ratcheted bar designed for bringing ribs closer together during thoracic surgery.

Allison Lung Retractor - A retractor used to retract the lungs. It features a 2½ inch-wide flat, wire spatula-shaped blade with a solid hook handle and an overall length of 12¼ inches.

Lovelace Lung Grasping Forceps - A 7½ inch grasping forceps with triangular-shaped jaws that create a large grasping surface area that is 25.0 mm wide. The purpose of the triangle shape is to

distribute the force that is applied; this is especially useful when grasping the lungs, so pulmonary tissue is not damaged.

Ryder Needle Holder - A needle holder commonly used in thoracic surgery with tapered, narrow, step-shaped jaws and serrated tungsten carbide inserts to hold a small suturing needle.

Bethune Rib Shears - A 13-inch rib cutter with double curved, slightly S-shaped handles and a small cutting head. The shafts are operated in a scissoring fashion.

The jaws have recessed points that offer protection to surrounding structures.

Hemoclip Appliers - A metal ligation system used to stop bleeding in a vessel. Both jaws have a groove cut in the inside of the jaw to hold the clip. These instruments are available in a wide variety of angles, jaw sizes and applier lengths. The applier's color-coded finger rings match the color of the ligating clip cartridge to be used. Appliers of all sizes are essential in thoracic surgery.



OBJECTIVE 4: EXPLAIN PROCESSING PROCEDURES FOR THORACIC INSTRUMENTATION

Instruments used in thoracic surgical procedures may become very grossly soiled and should be cleaned and decontaminated as soon as possible after use. Following transport to the decontamination area, multi-part instruments should be taken apart for effective cleaning. Instruments with jaws and box hinges need to be opened and inspected for gross tissue and bioburden, and kept open during the cleaning process. Instrument manufacturers' written, validated Instruction for Use (IFU) must be followed for proper use of enzymatic/detergent, proper use of the ultrasonic cleaner and proper instrument placement for automated mechanical washing.

In the instrument preparation area, instruments must be inspected for cleanliness, proper jaw alignment and function. There should be no rusting, pitting, corrosion, burrs, nicks or cracks on instrument surfaces. Cutting edges should be tested for sharpness. Multi-part instruments should be reassembled to test for function, and then disassembled for sterilization, unless otherwise stated in the IFU. It is essential to keep all instrument parts close together in the tray to facilitate quick assembly during an emergency. Meticulous care is required when assembling a set in order to match the instrument standard or count sheet for that set. The facility's packaging procedure must be followed each time. Diligent adherence to manufacturers' validated and written IFU is essential for each reprocessing step.

CONCLUSION

Thoracic instruments are specialty devices that may be used in routine or trauma surgical procedures. It is critical for the CS technician to understand

the role they play in successful thoracic surgery outcomes. A sound knowledge of thoracic instruments and procedures, combined with adherence to manufacturers' written and validated IFU when cleaning, decontaminating, packaging and sterilizing the devices, will deliver the highest quality instrument sets to the OR. 📌

RESOURCES

Price, P. *Surgical technology for the surgical technologist: a positive care approach: Thoracic Surgery*. Association of Surgical Technologists, 3rd edition,

International Association of Healthcare Central Service Materiel Management. 2016. *Central Service Technical Manual, Eighth Edition*.

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