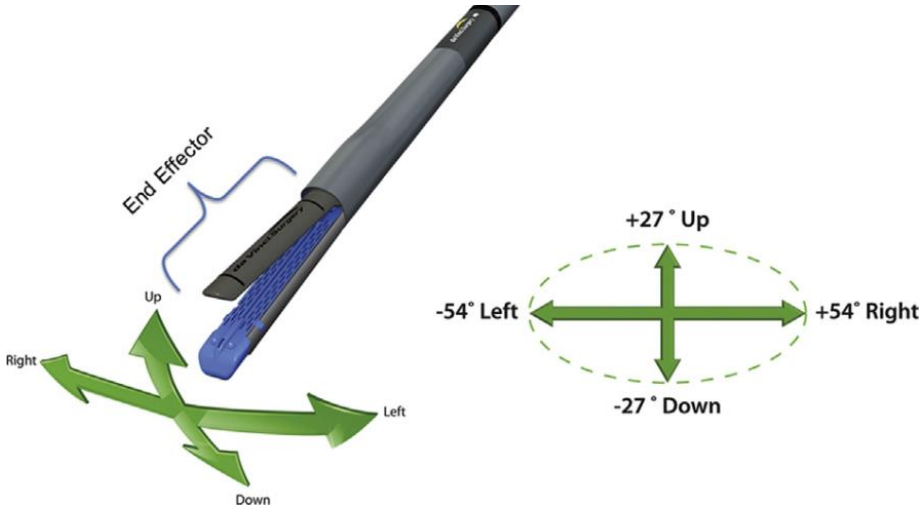
Robotic Lobectomy Utilizing the Robotic Stapler

Analysis by Daryl Phillip Pearlstein, MD, Department of Cardiothoracic Surgery, Hoag Memorial Hospital Presbyterian and the Hoag Family Cancer Institute, Newport Beach, California.

Background / Overview

The robotic stapler

- Allows surgeon to control the division of the hilar structures from robotic console
- Has a longer rotational end than other robotic instruments and articulates elliptically, in contrast to circular cone articulation of other robotic instruments



Elliptical range of motion for the robotic stapler.

Pearlstein D. Robotic Lobectomy Utilizing the Robotic Stapler. *The Annals of Thoracic Surgery*. 2016;102(6):e591-e593. doi:10.1016/j.athoracsur.2016.05.105.

PN 1034364-US Rev A 03/17

Robotic Lobectomy Utilizing the Robotic Stapler

Technique

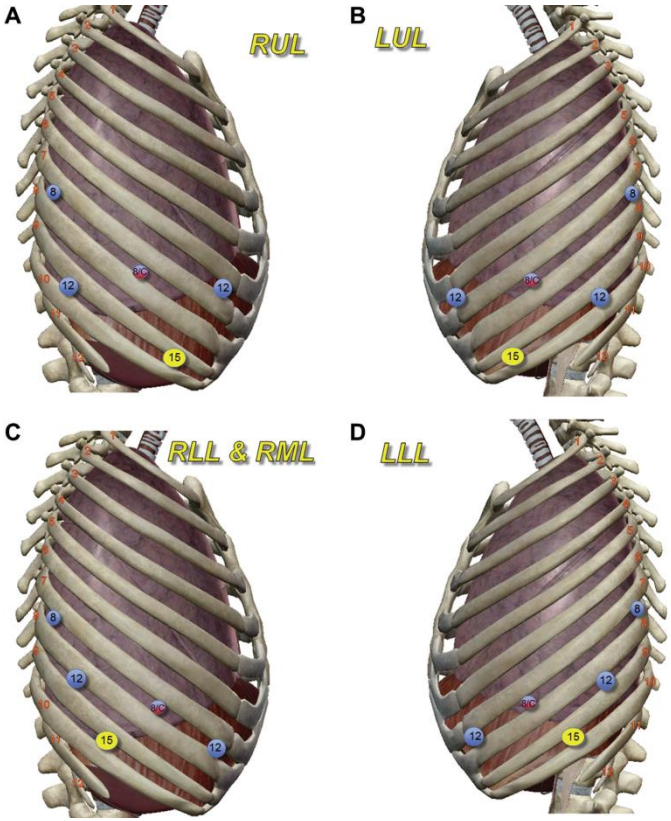
Ports

- Robotic stapler fits through a 12 mm robotic port
- Reducers fit inside the 12 mm port to house 8 mm instruments as needed and can be easily removed for stapler insertion
- Use two 12 mm ports (one anterior and one posterior) to optimize the stapler angle and cover all vectors for any structure needing division

Port Placement

- Place stapling ports as low as possible to allow the greatest degree of maneuverability in the chest.

Port (Size)	**Upper Lobectomies** (Figures A and B)	**Middle and Lower Lobectomies** (Figures C and D)
0° Camera (8 mm)	7th intercostal space	7th intercostal space
Stapler (12 mm)	9th intercostal space, posterior	7th or 8th intercostal space, anterior
Assistant (15 mm)	Between the camera port and medial 12 mm port	Between the camera port and lateral 12 mm port



Recommended port placement for all five lobes. Red indicates the camera, blue indicates the robotic arms (8 and 12 mm), and yellow indicates the assistant (15 mm).

Pearlstein D. Robotic Lobectomy Utilizing the Robotic Stapler. *The Annals of Thoracic Surgery*. 2016;102(6):e591-e593. doi:10.1016/j.athoracsur.2016.05.105.

PN 1034364-US Rev A 03/17

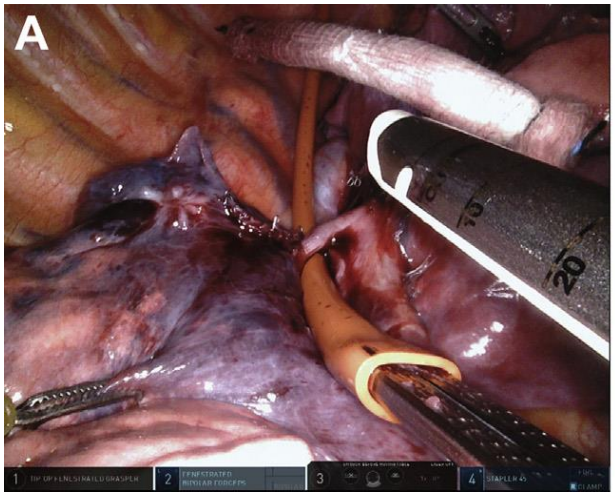
Robotic Lobectomy Utilizing the Robotic Stapler

Technique

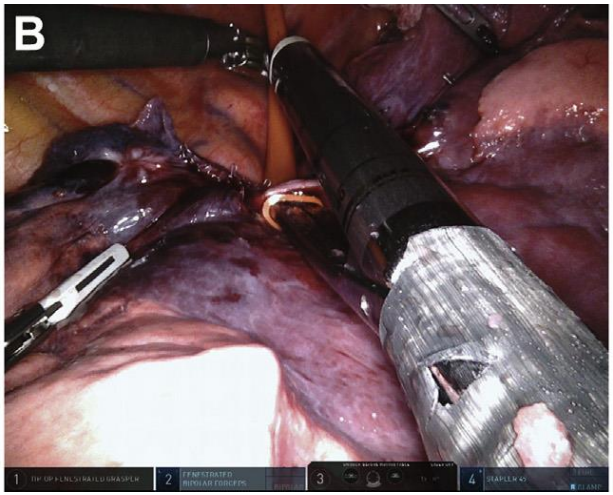
Positioning the *EndoWrist*® Stapler

- Clear a landing zone for the stapler by clearing lymph nodes, connective tissue, and possibly dividing the fissure on the opposite side of the target vessel or bronchus.
- Use a 14-French polyvinyl chloride (PVC) catheter as a stapler guide by cutting it flush at 12 cm and sliding the proximal end over the anvil of the stapler. This allows for gentle dilation of tight spaces (Figure B) and ensures that the anvil will lie in a safe plane above any important structures on the opposite side of the target vessel or bronchus (Figure C).
- Establish the proper position of the stapler before engaging the vital structure.
- Initiate the clamping and firing sequences.

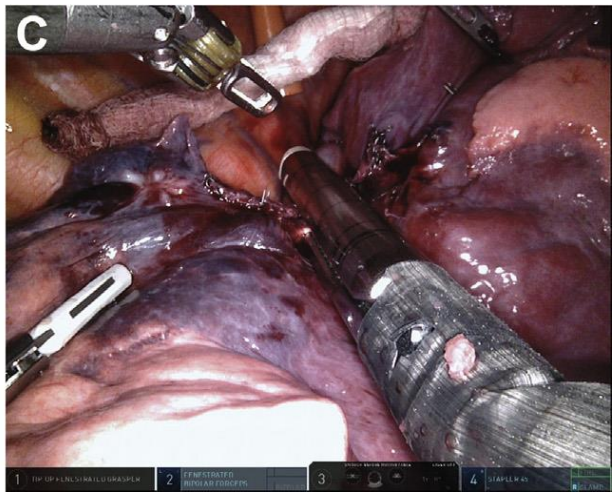
Polyvinyl chloride (PVC) catheter–guided division of the right lower lobe superior segmental artery



(A) Engaging the stapler with the PVC catheter.



(B) Advancing the stapler across the vessel.



(C) Stapler division of the vessel.

Pearlstein D. Robotic Lobectomy Utilizing the Robotic Stapler. *The Annals of Thoracic Surgery*. 2016;102(6):e591-e593. doi:10.1016/j.athoracsur.2016.05.105.

PN 1034364-US Rev A 03/17

Robotic Lobectomy Utilizing the Robotic Stapler

Conclusion

- The robotic stapler is a large device, and its motion is decidedly different from other robotic instruments.
- Robotic lobectomy using the robotic stapler can be accomplished safely and reproducibly using the techniques listed.
- Surgeon's ability to control the stapler from the console represents a critical technical advancement.
- It can allow surgeons with limited assistance the latitude to explore robotic lung resection and perhaps transition from open or video-assisted lobectomy.

Limitation

- Outlines one surgeon's early experience using the robotic stapler.

Pearlstein D. Robotic Lobectomy Utilizing the Robotic Stapler. *The Annals of Thoracic Surgery*. 2016;102(6):e591-e593. doi:10.1016/j.athoracsur.2016.05.105.

PN 1034364-US Rev A 03/17

Important Safety Information

Risks associated with Pulmonary Resection - Lobectomy: persistent air leak, pneumonia, prolonged mechanical ventilation >48 hours, atrial fibrillation, acute respiratory distress syndrome (ARDS), chylothorax, re-intubation, arrhythmias, bronchopleural fistula, phrenic nerve injury, esophageal injury, difficulty breathing, collapsed lung, pulmonary volvulus, recurrent laryngeal nerve injury leading to vocal cord dysfunction.

Serious complications may occur in any surgery, including *da Vinci*® Surgery, up to and including death. Examples of serious or life-threatening complications, which may require prolonged and/or unexpected hospitalization and/or reoperation, include but are not limited to one or more of the following: injury to tissues/organs, bleeding, infection and internal scarring that can cause long-lasting dysfunction/pain. Individual surgical results may vary.

Risks specific to minimally invasive surgery, including *da Vinci*® Surgery, include but are not limited to, one or more of the following: temporary pain/nerve injury associated with positioning; a longer operative time, the need to convert to an open approach, or the need for additional or larger incision sites. Converting the procedure could result in a longer operative time, a longer time under anesthesia, and could lead to increased complications. Contraindications applicable to the use of conventional endoscopic instruments also apply to the use of all da Vinci instruments. You should discuss your surgical experience and review these and all risks with your patients, including the potential for human error and equipment failure. Physicians should review all available information. Clinical studies are available through the National Library of Medicine at www.ncbi.nlm.nih.gov/pubmed.

Be sure to read and understand all information in the applicable user manuals, including full cautions and warnings, before using *da Vinci* products. Failure to properly follow all instructions may lead to injury and result in improper functioning of the device. Training provided by Intuitive Surgical is limited to the use of its products and does not replace the necessary medical training and experience required to perform surgery. Procedure descriptions are developed with, reviewed and approved by independent surgeons. Other surgical techniques may be documented in publications available at the National Library of Medicine. For Important Safety Information, indications for use, risks, full cautions and warnings, please also refer to www.davincisurgery.com/safety and www.intuitivesurgical.com/safety. Unless otherwise noted, products featured are available for commercial distribution in the U.S. For availability outside the U.S., please check with your local representative or distributor.

PN 1034364-US Rev A 03/17

Important Safety Information

The *EndoWrist*® Stapler 30 and 45 Instruments and Reloads are intended to be used with the *da Vinci Xi* Surgical System (IS4000) for resection, transection, and/or creation of anastomoses in General, Thoracic, Gynecologic and Urologic surgery. The *EndoWrist* Staplers 30 and 45 are indicated for adult use, and the *EndoWrist* Stapler 30 is indicated for pediatric use. The devices can be used with staple-line or tissue-buttressing materials.

The *EndoWrist* Stapler 30 and 45 Instruments and Reloads should not be used on tissue such as the liver or spleen, where tissue compressibility is such that clamping of the instrument would be destructive. Do not use the *EndoWrist* Stapler 30 and 45 Instruments or Reloads on the aorta.

The *EndoWrist* Stapler 30 and 45 for the *da Vinci Xi* System (IS4000) are not compatible for use with the *da Vinci*, *da Vinci S*, or *da Vinci Si* Surgical Systems.

The *EndoWrist* Stapler Cannula Seal is intended to maintain insufflation, and serves as a port of entry when used with the compatible Intuitive Surgical cannulae.

Dr. Phillip Pearlstein is a consultant for Intuitive Surgical, Inc. He did not receive any monetary compensation for this study. The study was not funded or supported by Intuitive Surgical, Inc.

PN 1034364-US Rev A 03/17