At the beginning of this talk I did notice one big thing, the variety in VATS technique. If you look at the literature there is two ports plus an access incision, one port plus an access incision, some surgeons are just using an access incision alone and putting a camera through their access incision. There is also a variety in the size of the utility incision, anywhere from 4 cm reported up to 10 cm reported; also the different approaches to the hilum when doing the VATS lobectomy. Clearly if you are going to use one port plus an access incision you are kind of stuck just looking at the hilum anteriorly; using a two port technique where you have a camera port and a posterior port plus your access incision would enable you to kind of manipulate the lung anterior to posterior in that you can work in the posterior mediastinum as well an anteriorly toward the hilum.

The first report of a VATS lobectomy was in the early ‘90s, now VATS lobectomy is kind of defined, it’s a true anatomic lobectomy, use your video screen for guidance as opposed to looking through your access incision at the anatomy, individual ligation of vessel and bronchus, mediastinal lymph node dissection or sampling and once again the use of one or two ports plus an access incision that will be from 4 to 8 cm and the key is no rib spreading. Historical background was first reported in 45 patients by McKenna who underwent VATS lobectomy and mediastinal lymph node dissection back in 1994.

Some of the initial concerns with VATS lobectomy, is it safe, can we get access to the thorax if we get into major bleeding issues, is it oncological effectiveness, is it the same – can we use the same
oncologic principles that we do in open surgery and the risk of recurrence in terms of port site recurrence? These were the initial concerns.

McKenna presented a paper in 2006 showing a 12 year experience of 1100 patients who underwent VATS lobectomy, there were no intraoperative deaths, there was a 2 ½ conversion rate to thoracotomy. The apparent advantages clearly were length of stay was lower and a lower rate of complications. This did have an increase in the VATS lobectomy from less than 10% in 2006 to about 15 to 20% presently.

The CALGB study of VATS lobectomy in 2007 was a national study showing the effectiveness of VATS lobectomy. There were certain criteria for each surgeon, participating surgeons were required to undergo certain credentialing. They had to attend a VATS course to review techniques, submit unedited videotapes, operative and pathologic reports on their VATS lobectomy were under review. They needed to participate in animal laboratories and the surgeons needed to perform at least 5 VATS lobectomies before being credentialed.

Between ’98 and 2001 128 patients with peripheral lung nodules, 3 cm in size, suspicious for non-small cell underwent surgery. 87% were Stage I, 96 had their procedure completed by VATS, 14% had a conversion rate to open. A standardized approach to the VATS was specifically defined with the avoidance of rib spreading is feasible.
Another comparison to the VATS the open thoracotomy with lobectomy was in 13,000 patients, the comparison of VATS to open in a national database. This study showed that the VATS group had a significantly higher incidence of intraoperative complications than thoracotomy, an accidental puncture laceration that complicates surgery, foreign body accidentally left during procedure and bleeding. There is also a socioeconomic disparity, higher percentage of patients with an annual income greater than $59,000 underwent VATS as a person with less than that had an open procedure. This study showed that VATS lobectomy were 1.6 times more likely to have intraoperative complications than patients who underwent open lobectomy. Short mortality, length of stay and hospital costs were similar and there did seem to be a socioeconomic disparity between VATS and open.

This is some of Dr. Landreneau’s data from his experience between ’96 and 2008. Survival rates for stage I to stage IIIA disease using VATS lobectomy.

Dr. D’Amico at Duke published a paper in 2008 showing his postoperative complications, the left column is the open procedures, the middle column is the VATS procedures showing decreased rate in a-fib, air leaks, pneumonias, shows a significant decrease in postoperative complications and deaths.

Advantages to VATS lobectomy. So there is less pain, shorter length of stay, quicker return to normal daily activities, less impairment in shoulder function, preserved pulmonary function, reduced
cytokine release and earlier chest tube removal. Also it can have improved delivery of adjuvant chemotherapy if necessary, it’s more cost effective, possible improvement in survival for patients in early stage lung cancer. Despite advantages only about 15 to 20% of lobectomies are performed using VATS. There is a steep learning curve, McKenna quotes that the learning curve for VATS lobectomy is about 50 VATS lobectomies. It is technically demanding and three is a risk of uncontrollable hemorrhage.

When to do VATS? Who is the ideal patient? Right now we would say the ideal patient is someone with a T1 or T2 lesion without significant hilar nodal disease. Limitations are training. Standard of care for treatment of stage I and II non-small cell lung carcinomas are lobectomies with complete mediastinal lymph node sampling or dissection. The approach to lobectomies the priorities are patient safety should not be compromised nor should the oncological principles be compromised.

How to introduce new technologies such as the VATS lobectomy to your practice and training. Education is the key, McKenna proposes VATS training during residency, minimally invasive Fellowships, courses such as this to help promote and teach some of the techniques of VATS lobectomy and visiting centers of excellence.

Some of the recommendations before tackling VATS lobectomy is to perform open lobectomies versus the anterior approach to kind of get used to looking at that versus the posterior lateral approach, perform greater than 100 minor VATS procedures, drainage of effusions, wedge
resections, lobectomies to help facilitate your VATS learning, attend formal courses in VATS lobectomy, visit established program, simulator training is very important. The other important aspect is pick one approach to the operation and stick with it, careful patient selection and data collection. It’s important to have a dedicated operating room team, maintain education in the field, monitor complications with long term outcomes and participate in the national database. Have experience with thorascopic procedures like I said, do smaller more minor procedures initially. The surgical team should have a good exposure to the procedures. Once again start with simple procedures like biopsies, pleurodesis, wedge resections. To be realistic about the possibility of developing a VATS program, your practice should have a significant number of anatomic resections. Transition to the anterior approach initially you should set a time limit for attempting your VATS approach, it should be important to be able to continue to make progress during the operation. If an additional incision is needed or additional port do not hesitate and if conversion is needed do not hesitate to convert to a thoracotomy.

The reasons to start all resections with a VATS, your training and skills will get better even if you go in and just do some early mobilization, take down the inferior pulmonary ligament, open up the mediastinal pleura, dissect out the vein, doing these initial procedures with VATS and then converting to open procedure to do some of the pulmonary artery work gives you additional insight to tumor extent and certain patients will unexpectedly be suitable for VATS. In a recent study a subgroup of patients who were eventually going to undergo thoracotomy were started VATS and 8 of the 27 patients were completed by VATS.
Indications. Some of these are more relative at this point in time, any clinical stage I and or stage II lung cancer, tumor of less than 5 cm although certainly in the literature there is centers that are tackling tumors that are larger than 5 cm, benign diseases such as giant bolus disease or bronchiectasis and the physiologic operability of the patient.

Possible contraindications, significant nodal disease whether malignant or benign. I know we did a difficult case last week with a patient who had previous – had sarcoid making the dissection quite difficult. Patients with silicosis are also very difficult to dissect around the vessels due to nodal disease, chest wall or mediastinal invasion, centrally located tumors and the possible need for sleeve resection.

Potential indications for an open approach. This is also kind of relative. Neoadjuvant therapy whether it be chemo and/or radiation, we are seeing a little bit more referrals after neoadjuvant therapy. If you look at Dr. D’Amico’s work of his first 500 VATS less than 3% were done after neoadjuvant therapy and open lobectomy is probably the safest option particularly early on in your experience.

Operative considerations. You want a patient in the lateral position, maximally flexed, the use of angle scopes is very important in allowing you to see around angles and around corners. Proper port placement is essential, palpate the lesions, avoid excessive torque, that’s really when we are stapling
the vessels. Once your stapler is in position and you are ready to fire it’s important for everyone to relax, have no traction on the lung or on the vessel. And a lymph node dissection after the specimen is removed. Like I said maximally flex the patient in the lateral decubitus position, you want to tilt the patient slightly posteriorly to prevent the hip from interfering with your camera port. Your access incision can be anywhere from 4 to 8 cm.

We favor to use the two port system here with the camera port and one posterior port. The camera port allows us to look anterior to posterior at the hilum and you want to place your access and port as anterior as possible. The camera port should be placed about the 8th intercostal space along the anterior axillary line from the right side of lesions, right side of resections and the posterior axillary line for left sided lesions to avoid the apex of the heart. That posterior port if it’s going to be used should be placed where the lower lob touches the diaphragm posteriorly.

Utility or access incisions should be placed perpendicular to the anterior axillary line. For an upper lobectomy you want to place the incision over the superior pulmonary vein, although some surgeons prefer to put it over the major fissure. Regardless of where you place that whether it’s over the pulmonary vein or over the fissure if you are going to do a lower or middle lobectomy you should place that incision 1 interspace lower. You want to place your utility incision anteriorly and do not base that incision on an open thoracotomy approach. You’ll make – if you do that you are going to make your incision too posterior and be looking down at the hilum instead of anterior at the hilum.
The use of linear and articulating staples are of benefit, use the curved tip vascular loads. You can use a red rubber catheter at times can be beneficial to get around the vessel and then feed the stapler into the hub of the red rubber and pull it through. Avoid using clips, use familiar standard instruments that you would use in an open procedure. Have a sponge stick available in case of bleeding. In terms of vessel control the majority of the times we use staplers to control the pulmonary vein and pulmonary artery branches. Dr. Landreneau is kind of a proponent of using the ligature device for some of the smaller pulmonary artery branches. This is what your results should look like postoperatively.

Technical tips if there is bleeding issues have a sponge stick prepared to help control bleeding, have an open thoracotomy tray available. I think it’s important to gain control of the bleeding and then communicate with the staff, do not panic, communicate with anesthesia, make sure blood is available in the room. Have your operating room team ready and have the open tray available and access.

And the final conclusions, keep safety as a top priority. The most important aspect of treating lung cancer is not to compromise the oncologic principles. Patient selection is important, specialty training is important and has an impact on the outcomes. You should have a methodic approach to implementing a VATS program and open lobectomy is still standard and needed in many cases.