ANNOUNCER: Welcome to Sentara Heart Hospital in Norfolk, Virginia. Over the next hour you'll see a minimally invasive lobectomy for lung cancer performed live. The minimally invasive technique involves removing a portion of the lung without cutting large muscles, without performing a sternotomy, or spreading open the ribs. As a result, patients leave the hospital sooner than with conventional lung surgery. Recovery time is reduced, and patients get back to their normal routines more quickly. OR-Live makes it easy for you to learn more. Just click on the "Request Information" button on your webcast screen and open the door to informed medical care. Now let's join the doctors.

KIRK J. FLEISCHER, MD: Hello. Welcome to the OR-Live surgery webcast of a minimally invasive lobectomy for lung cancer. My name is Dr. Kirk Fleischer, and I'm part of the surgery team at the Sentara Thoracic Surgery Center at Sentara Heart Hospital. Sentara -- slide, please -- Sentara is a Hampton Roads-based not-for-profit healthcare system that has grown to seven hospitals over its 118-year history. It is the largest healthcare provider of the region. Sentara serves more than 2 million residents in eastern Virginia and northeastern North Carolina. The surgeon performing the procedure today is my partner, Dr. Joseph Newton, the director of the Sentara Thoracic Surgery Center. Dr. Newton, Dr. Michael McGrath, and myself perform the thoracic procedures in our group, Mid-Atlantic Cardiothoracic Surgeons. In a moment, we will be joining Dr. Newton and the surgical team, who commenced their procedure about an hour ago. But first, I'd like to briefly discuss our patient today. He is a pleasant 59-year-old gentleman with a 20-year history of smoking as well as exposure to asbestos. His medical history is also remarkable for high blood pressure and the removal of a kidney for cancer. During routine follow-up, he is found to have an abnormality on his chest x-ray. One can see that the lung fields look clear and normal except for a density noted in the upper portion of the right lung. He denied any symptoms of cough or chest pain. He subsequently underwent a CT scan of the chest, which confirmed the presence of a 2-centimeter mass in the upper lobe of the right lung. The CT scan shows quarter-inch slice images of a patient lying on their back. On this image, you can see the windpipe, or trachea, in the center; the bright white areas are the bones -- ribs, spine, scapula, or shoulder blades; the two black ovals are the normal lung tissue; and the obvious white tumor in the right lung. This drawing outlines some of the basic anatomy. The lung tissue is composed of millions of tiny air sacs called alveoli. These sacs open into progressively enlarging airways to eventually form the main bronchi and trachea. The alveoli are the areas of gas exchange, where oxygen enters and carbon dioxide leaves the blood. The right lung is divided into three lobes: the upper, middle, and lower. The left lung is divided into the upper and lower lobes. The clefs between the lobes are called the fissures. They are sometimes fused together, especially between the right upper and right middle lobes. This can make the removal of the individual lobe, called a lobectomy, more challenging. I've checked with Dr. Newton in the OR, and unfortunately our patient does have a fused fissure. Along the airways are also lymph nodes, as signified by these green
dots. As we'll discuss later in the broadcast, cancer cells found in these lymph nodes will determine the choice of therapy as well as the prognosis in patients with lung cancer. Let's now join Dr. Newton in the operating room.

00:04:35

JOSEPH R. NEWTON, MD: We are underway with this patient's right upper lobectomy, but first I'd like to introduce the operating team. I'm Dr. Joseph Newton, the surgeon. This is Dr. David Schinderle, the anesthesiologist. Mr. Mark Dewey, Ms. Annie Kay, my assistants. This is Lisa Gilberts, certified surgical technologist. This is Michelle Hughes, registered nurse, as our circulator. Mr. Alfreda Watson is cardiovascular technologist. We'll go now to image from our scope that's inside the chest. Pickups, please. And we'll demonstrate a few things for you. You can see the heart here beating within its sac, the pericardium, the thin sac that surrounds the heart. Here is the phrenic nerve. This nerve is critical to innervation of the right diaphragm and breathing in the patient. We'll preserve that. And then you can see here in the hilum, or the root of the lung, some white surgical tape that are around some of the blood vessels leading to the right upper lobe that we'll be dividing momentarily. Going to go back to Kirk now, and he'll tell you a little bit about how we got to this point in the operation.

00:05:50

KIRK J. FLEISCHER, MD: Prior to commencing the procedure, the surgeon performs a final review of the CT scan to confirm the location of the tumor. The patient is sedated, and initially a large single lumen breathing tube is inserted into the trachea. Through this tube, a fiber optic camera called a bronchoscope is inserted. The bronchoscope is used to confirm the patient's airway anatomy and check for the rare, unexpected airway tumor. The anesthesiologist now exchanges the initial tube with a double lumen endotracheal tube to permit separate ventilation of each lung. As you will see, by collapsing the operative lung, we can perform the procedure much safer and easier. Invasive catheters, including an arterial line for instantaneous blood pressure monitoring and a central venous catheter for infusion of medications are inserted. Heart rhythm, blood pressure, and oxygen saturation are closely monitored during the procedure. Even in minimally invasive procedures, pain control is very important. Epidural catheters are routinely inserted into the spinal fluid space. These permit excellent pain control postoperatively without altering mental status. The patient is positioned on their side with appropriate pillows and padding to reduce risk of compression injury to nerves and soft tissues during the procedure. As the patient's chest is prepped, the operative team scrubs, confirms the correct side of the operation, and then drapes the patient in preparation for surgery. Before incision, the surgeon also confirms with the anesthesiologist that the lung to be operated on has been deflated by use of a balloon on the end of a double lumen breathing tube. Collapsing the lung reduces the chance of lung injury during entry into the chest cavity. The location of the tip of the scapula, or the shoulder blade, is marked, as well as the planned location of the minithoracotomy incision. After incising the skin, some of the chest muscles are divided, while others are preserved and mobilized to keep the skin incision small. We've routinely removed a short segment of rib to reduce injury to the rib cage when the small retractor is placed. Again, our goal is to optimize visualization for safety while minimizing chest wall trauma for a speedy recovery. Between one and three additional 1/2-inch incisions are made for insertion of the minimally invasive ports. These provide easy access for the video camera as well as the collection of endoscopic instruments used in this procedure. This illustration demonstrates the traditional full thoracotomy incision, a painful incision with a long recovery time. Comparing this incision with the small incisions used with minimally invasive techniques, one can see that there are some important advantages associated with reduction and injury to the chest wall. Less trauma to the skin, ribs and muscles results in less pain for the patient and less impairment in their breathing capacity after surgery. Overall these benefits, especially preservation of pulmonary reserve, results in a quicker
return to activities of daily living for our patients. Now let's return to Dr. Newton in the operating room to continue our live coverage.

00:09:02
JOSEPH R. NEWTON, MD: We're back in the operating room now ready to divide some of the vessels to the upper lobe. Dr. Fleischer just mentioned the double lumen tube that the anesthesiologist placed. This allows us to deflate the lung that we're operating on. That gives us a little bit of working area. So what you see here in the field is deflated lung. The patient is ventilated on the opposite lung, or left lung in this case, and that keeps the oxygenation going well during the procedure. This is one of the stapling devices, which we'll talk to you -- explain to you about a little bit more in a minute. This white surgical tape is around the vein to the upper lobe. We're going to just place this stapling device around that and go ahead and divide that vessel, which we're doing now. Squeeze down on the stapler and then fire the staples. That seals both sides of that blood vessel and divides it. One additional blood vessel that's going to -- duval now, please. One additional blood vessel that's going to the upper lobe, the pulmonary arterial branch needs to be divided. And we're going to rearrange our instruments and our camera here. Let's switch to the other port for the camera now. Thank you. It is important, of course, to preserve all the various venous and arterial and windpipe branches to the lobes that remain in the patient, in this case, the middle lobe and the lower lobe, while dividing the vessels that are going to the lobe to be removed. We will see if we're ready to get around the upper lobe artery at this point. Can I have the peanut, please? The artery is a very delicate structure. Let me just have the right angle back for a minute. I did not use that stapler. And then a pair of pickups. I'm going to do just a little bit of an additional mobilization or dissection around this artery to allow the stapler to safely pass. This extra time and dissection pays off. We're just making a little bit more space behind the artery. Behind the artery is the windpipe, and it's important to be just in the right plane or area there -- not too deep, not too shallow. You can see hopefully that we have created a little bit more working space. Now we can place the stapler again. Open the stapler, slip the anvil part of the stapler behind the vessel. A peanut now, please. There you go. We're around. Let me have a peanut. Peanut's the term we use for this little white piece of gauze that we sometimes use to push away tissue that we don't want to divide. You see how nicely that worked? Pickups again. So we are now around the main arterial branch to the upper lobe. Not the only arterial branch. But we are going to close the stapler and fire like we did previously, thus dividing that main branch.

00:13:25
KIRK J. FLEISCHER, MD: Nice job, Joseph. That's probably the scariest part of the operation.

00:13:29
JOSEPH R. NEWTON, MD: In the systemic part of the body, the arteries have the most elasticity and are the most able to tolerate dissection and the veins are the most fragile, but in the lungs, it's the other way around. The veins in fact are sturdier -- Bovie -- and the arteries are more delicate. We can go to Kirk now and he'll show you a schematic of what we just did.

00:14:01
KIRK J. FLEISCHER, MD: Thanks, Joseph. This is a schematic of the anatomy that Joseph was outlining for you all. The heart is to the right. The right lung is to the left. You can see the three lobes of the lung. The phrenic nerve passing along the course of the heart. And obviously we try to avoid any injury to that area. There's a peel of lining of the lung that also goes onto the chest wall that's dissected here so that you can see the three major structures: the pulmonary vein, the pulmonary artery -- and these were the two that Joseph just divided -- and the bronchus, the airway. A more skeletonized image, you can see the structures a bit easier. The open circles in the drawing represent connections with the heart. And oxygen-poor blood passes from the right side of the heart, through the pulmonary artery, out through the artery to the upper lobe, then goes to the alveoli to drop off carbon dioxide and pick up oxygen, and then returns in the pulmonary vein back to the left side of
the heart, where it's ejected out through the aorta to provide oxygenated blood to the body. So for this procedure to remove the upper lobe, we need to divide the pulmonary veins to the upper lobe, avoiding those veins to the middle lobe; the pulmonary arteries -- we've divided the first, but there can be at least two or three more -- and the windpipe. Let's return to Joseph now to see how he's bearing.

00:15:30

JOSEPH R. NEWTON, MD: Well, things are going well, Kirk. We've got a little bit of additional dissection. And we are going to divide some of what we call the fissure. Dr. Fleischer mentioned that earlier. The fissures are the normal clefts between the different lobes, and everybody is different in terms of how complete those fissures are. Some people don't have a very complete fissure, as this patient. But with some dissection in patients, you can get through those areas. And let me have a right angle again. And that allows you to separate the tissue of the lobe that you're removing from the tissue of the lobe that remains in. So you have to divide not only the vasculature and the windpipe, but also the tissue of the lung itself.

00:16:33

KIRK J. FLEISCHER, MD: Those bands of alternating light and burgundy in the back there are the ribs and the muscles between the ribs.

00:16:42

JOSEPH R. NEWTON, MD: Mark, I'll have you take that that way and pull up towards the ceiling as much as you can on your -- Annie, maybe you can reach over to the duval in Mark's left hand. That'll allow Mark the freedom to -- all right, let me have pickups, please.

00:17:01

KIRK J. FLEISCHER, MD: As you can see, there's a little bit of acrobatics when you have small incisions. It's a big team effort to make these operations work successfully.

00:17:19

JOSEPH R. NEWTON, MD: Mark, pull on your [umbo] tape a little bit less. Okay, that's fine. Let me just see here. Peanut again. Sometimes -- what I'm going to do is I'm going to take this with two firings, so we'll need a reload on this stapler. I'm going to go ahead and close this device. There you go. And staple. And we'll take a reload on that. And let me have pickups in the right angle as well. As you can see, we keep our circulating technologist very busy. We work at a phenomenal facility here with an excellent team. It really is a team approach here at the center with a lot of very, very talented people, doctors and nurses and respiratory therapists and rehabilitation people. The total team approach I think really contributes to our outcomes. That's good. We're now completely across this fissure, and we're going to go ahead and continue to finish separating what is the upper lobe, which is coming out -- that's the lobe that contains the cancer -- from the lower lobe. In this case, I'm separate now the upper lobe from the lower lobe. So that completes that. And Annie, we can let this down. Scissors. Kirk, at this point I think what I'll do is I'll show the stapler devices. Let me have one of the staplers. And just for the camera, we'll demonstrate these stapling devices are made by Ethicon Endosurgery. Basically, they are devices that have a jaw that open, as you see there. And this yellowish cartridge is replaceable. It has multiple rows of staples on each side. In fact, there's three rows of staples on each side and a center channel that a knife blade goes down. Those tiny staples are offset like bricks in a wall such that they seal the tissue. Then you can close and then fire. You can see some of the loose staples there. And that's how it works. And we have different staplers, some for the lung tissue, which is this one. We have some that are specialized for the blood vessels and some that are specialized for the windpipe. Kirk now will show you a demonstration. Kirk?

00:20:28

KIRK J. FLEISCHER, MD: Thanks, Joseph. We have a similar stapler that Joseph is using now to divide the lung tissue with our simulated lung here. And the rows of staples, three rows on each side of the blade. And there's a cutting blade that divides between the two. And we clamp down onto the lung. The lung is very similar to this sponge here. And a few
firings of this stapler. And the end result is sealed edges that are air- and watertight so that
the lung can function as a closed entity. And you can see the three rows of staples on each
side and the cutting that it went between.
00:21:15
JOSEPH R. NEWTON, MD: Kirk, yeah, we are actually now going to go ahead and divide the
windpipe. And I have the stapler here that divides the bronchus, or the windpipe. We'll
place that. We have -- that white tape, again, is around that windpipe. Again, we have
differentiated the windpipe that goes to the upper lobe from the windpipe that goes to the
middle and lower lobe. You can go ahead and take that, Mark. That's great. And once we're
in position, nicely, nicely placed there, and seated. And again, we'll close that off. And I'll
take a knife now. We call this the bronchial stump. It's the root of the windpipe through the
upper lobe. Kirk mentioned before the bronchoscopy part of the procedure, which of course
we did probably about an hour and 15 minutes ago on this patient. And in fact you could
see this patient's tumor in the windpipe. It was a fair ways out, so I don't think we'll see it
right here. Turn that up toward the head of the table, Mark, a little more. That's great.
Perfect. But the benefit of doing the bronchoscopy is you do see additional pathology and it
gives you additional thoroughness in your assessment of the patient. Okay, Kirk. So there I
don't know if you can see that. You might go to my head cam now if you can do that. Yes. If
that's up now, you'll see the end of the stapled end of the bronchial stump. I don't know if
that's -- okay. Right there. Okay, good. Well, Kirk, you might want to tell them a little bit
about the center now. We're going to do some additional dissection and you can tell them a
little bit about the Sentara Thoracic Surgery Center here.
00:23:27
KIRK J. FLEISCHER, MD: Thanks, Joseph. The Sentara Thoracic Surgery Center is dedicated
to providing top-quality patient care through a multidisciplinary approach involving many
specialties, including pulmonary and critical care medicine, cardiothoracic anesthesiologists,
oncologic and radiation specialists. We employ a centralized process of rapid evaluation of
new patients by means of a nurse practitioner, a protocol-driven process that is closely
overseen by physicians. The center provides services for all facets of the care of thoracic
surgery patients, including quality follow-up, support groups, and a variety of research
initiatives. The Sentara Thoracic Surgery has been innovative in bringing many regional
firsts. In the 1990s, we were the first in the region to perform induction chemotherapy
followed by resection for more advanced cancers. We also were the first to perform lung
volume reduction procedures for severe emphysema. In the 2000s, we were the first in the
state to track our results through the Society of Thoracic Surgeons database. Today, we
remain only one of two groups in the state and the only one in Hampton Roads using the
STS database. We were the first to perform percutaneous ablative procedures of lung
lesions in conjunction with interventional radiology. And most recently, we were the first in
the region to perform robotic-assisted thoracic procedures. With this recognition, and as our
multidisciplinary team has grown, the volume of thoracic procedures performed at the
center has steadily increased. We are on track to perform almost 500 cases this year, and
with this, we are by far the largest provider of thoracic surgery care in the region. The
higher volume as well as the advanced subspecialty training of our physicians are
recognized in the recent medical literature as the key indicators that derive high-quality
care for our patients. This slide demonstrates our lobectomy mortality. The dark blue line
represents the expected 1.5 percent mortality benchmark across the country. For the last
two years, our mortality has been 0. We are a comprehensive thoracic surgery center. Not
only do we perform procedures for lung cancer, but also benign lung processes and diseases
of the airway, mediastinum, esophagus, and pleura. In short, any pathology in the chest
can be cared for at the center. Even performing all these diverse procedures, we continue to
have a very low overall mortality. This is a credit to the excellent care provided for by our
experienced multidisciplinary team of physicians, nurses, and assistants. Joseph, is this a
good time to go ahead with your video clip or would you like to come back to the operating room to show us something?

00:26:27 [video rolls]

INTERVIEWER (on tape): Can you give us an overview of the procedure?

00:26:29

JOSEPH R. NEWTON, MD (on tape): Yes. The minimally invasive lobectomy performed at the thoracic center, which is a part of Sentara Heart Hospital, is a state-of-the-art procedure that is designed to deliver the highest possible quality of care to the patient. Basically, we use thorascoscopic instruments, which are instruments that allow the surgeon's hands to be outside the chest but deliver an action inside the chest to accomplish parts of the lobectomy. We also use a thoracoscope to give us visualization. And we also make a small-access incision that allows us to remove the specimen and also gives us some direct vision as well. So we can really see the primary tumor or cancer, the lymph nodes, and the anatomy for multiple different perspectives as we work through the case. Part of what we try to do here at the center is manage the entire process. When a patient's told they have a spot in their lung or if it's already diagnosed as a cancer, they and their families are usually quite nervous and anxious, understandably. And so really from even that point, when we get the first phone call and the first referral, we want to help manage the patient through that process. And very quickly our nurse practitioner will call the patient and the family and begin to step them through the steps of which tests they need. Within a week or 10 days, we have the patient in front of their doctor, myself, one of my partners so that they have a face-to-face conversation about the results of their test and what an optimum plan would be for them. So we try to do that in an expedient way to minimize their anxiety. Once they come to the hospital, they then get an education about what the process is going to be like so that they know what to expect. Then the day of their surgery, they'll come in and they'll meet the anesthesiologist. The anesthesiologist will put in an epidural catheter to help manage their discomfort in the postoperative period and then basically take them on to the operating room and put them off to sleep. At that point, we perform the procedure, which takes generally between two and three hours. Thereafter, they go to the ICU. There is an excellent staff of ICU nurses. They go to the floor after the ICU, and they're in the hospital between three and five days usually for most patients. But during that period of time, they're seen by very, very high-quality group of pulmonary and critical care medicine specialists that work with Sentara. There are oncologists that are available, pulmonary rehab. So all the different multidisciplinary parts of their care can be brought to bear during this one period of time. And then that way when they leave, they know exactly what they had, exactly what was done, and what, if anything, more needs to be done. And that's already in place for them. We are the only hospital in the region that participates in a national database and only one of two in the state. And we compare our results with national benchmarks, and our results are better than national benchmarks. And again, I think that's a tribute to the whole multidisciplinary team.

00:29:38

JOSEPH R. NEWTON, MD: We are now ready to begin the division between the upper lobe and the middle lobe. I'll be placing the stapler to divide that tissue, making sure that we're well away from the tumor.

00:30:01

KIRK J. FLEISCHER, MD: Joseph, we had an email about the dark veining that is running through the tissue, whether that's from smoking. That's exactly right. The deflated lung is a little bit darker like a deflated balloon, but those streaks that you see in there are from the 20 years of smoking this gentleman had.

00:30:24

JOSEPH R. NEWTON, MD: This is where Kirk mentioned earlier that this fissure was particularly deep, and so we're working our way through that. Lisa, I may need one more refill. We're good here. Great. Now, let me have the right angle next. Yeah, there you go.
That's right where we want to be. There we go. Okay. That's nice. We have successfully divided the middle lobe from the upper lobe now. Let's have a pair of scissors, please. Remove the tape, which is not needed any longer. That's great. Very, very, very good. Now let's have the Harmonic scalpel. You also at this point, the lobe is only connected by a few of the lymphatic channels. This dark structure right here, if we can see that on the camera or not. Okay, dark structure right here at the tip of the sucker and at the tip of my instrument is a lymph node. It is a little bit enlarged. We'll remove this. We do a thorough and complete lymph node dissection on all of our patients. That's important for staging the patients and understanding whether or not they need any additional treatment such as chemotherapy or radiation. If these lymph nodes are not involved, then typically you do not need radiation or chemotherapy and surgery alone is the treatment of choice. I'm using a device now called a Harmonic scalpel. It's a little bit different than the electric knife we have used earlier. This is actually -- it delivers a vibrating mechanical energy to denature the proteins in the tissue and cause the tissues to seal. It's a particularly good device around the heart, as it avoids the creation of any arrhythmias. Here at the heart hospital, if we had any of those, we'd certainly be well versed in taking care of that, but we'd like to avoid them nonetheless. We are really just about at a point where we can remove our specimen now. Duval. We have some additional work to do in terms of taking out lymph nodes, which we'll do in a moment, but we are going to go ahead and bring out the specimen. There you go. Okay, that's the patient's upper lobe coming out. Now, once we have the specimen out and everything is fine within the surgical field, we double-check that, make sure all the blood vessels are sealed appropriately. And that looks real good in there. We're now going to look at our specimen. We do this with a different set of instruments. And then as soon as we look at the specimen, we pass it off the field. As you can see, the upper lobe is in a basin, which will go off the field. This is the edge of the windpipe right here, and I'm going to remove a section of it. We always check our margins to be sure that they are clear and do not have any evidence of cancer in them. There we go. That's good. We'll send that down to the pathologist and have them analyze that right now to be sure that that's clear. If it's not clear, there is a more specialized procedure that we can do, and a little later we'll tell -- Kirk'll tell you more about that. I'm cutting into the upper lobe, and this is a very nice demonstration of the patient's cancer. Hopefully you can see that well. This area right here is what's abnormal. This is what we saw on the chest x-ray and on the CAT scan. This area out here is normal lung tissue. You can see a little fine pattern in it and some dark spots, some little cut blood vessels from where we just opened up the specimen. But this rounded area that we cut in half is the abnormal cancer that's now out of the patient. Kirk, at this point you might want to tell them a little bit about how we treat lung cancer overall at the center and follow it up.

00:35:54

KIRK J. FLEISCHER, MD: Thanks, Joseph. Lung cancer is the leading cause of cancer death in the United States. There are over 200,000 new cases diagnosed each year and 160,000 deaths annually. Since 1987, it's the most common cause of cancer death in women. Seventy thousand women die each year from lung cancer compared to 40,000 to breast cancer. The epidemic of lung cancer over the past century parallels the increased incidence of smoking. Tobacco is the most common cause of lung cancer, accounting for more than 85 percent of all cases. Smokers have a ten to twenty-five-fold increased risk in developing lung cancer. Even secondhand smoke has been shown to increase risk. Occupational and environmental exposures account for another 10 percent of cases. These agents include asbestos and radon, which is the leading cause of lung cancer in nonsmokers. Unfortunately, symptoms usually develop late in lung cancer. Cough, weight loss and chest pain are the most common symptoms if they do occur. The standard workup for lung cancer is a thorough history and physical exam, a chest x-ray, and a chest CT with IV contrast. Other tests, including a PET scan and brain scan, will be performed depending on a patient's individual case. Pulmonary functions test estimate a patient's pulmonary reserve to
determine if they will tolerate removal of part of the lung. All lung cancers are staged based on a TNM system. T classifies the features of the tumor itself. N represents the involvement of lymph nodes. And M signifies if distant metastases are present. It's a very complex process involving information gathered from studies ordered preoperatively as well as the findings at the time of therapeutic or diagnostic procedures. As Dr. Newton mentioned, involvement of the lymph nodes around the airway often determines whether a patient is a surgical candidate or not or if they're discovered at the time of lobectomy, whether chemotherapy will be needed postoperatively. The standard treatment for cure of lung cancer is the lobectomy. Although depending on the extent of disease and the pulmonary reserve of the patient, more or less lung may be resected. Some cancers are best treated with chemotherapy or radiation therapy before or after surgical resection. The advanced lung cancers that are nonoperative are usually treated with chemotherapy with or without radiation therapy. Back to you, Joseph.

JOSEPH R. NEWTON, MD: We are now going to dissect some of the lymph nodes out. You can see on the camera, here is the edge of the bronchus that you saw us take earlier, some of the lung tissue down here. This is actually the superior vena cava, the blood vessel that comes down from the brain and the head, the arms, and leads blood back to the heart. And this dark area here is a lymph node, which we're going to remove and send to pathology. We want to seal all the lymphatic channels and small blood vessels but preserve the important nerves and other vascular structures.

KIRK J. FLEISCHER, MD: Joseph, I have an email question that came from Sharon in California. She writes, "I had this procedure --

JOSEPH R. NEWTON, MD: Glad to know we have some west coast people watching.

KIRK J. FLEISCHER, MD: Right. "I had this procedure done in October of 2007. I'm curious as to the outcome of this certain procedure compared to conventional surgery." And currently, both short and long-term cancer outcomes are the same for these procedures. Really, the primary benefit of this technique is a quicker recovery and a quicker return to regular activities: exercise, work, life. Back to you, Joseph.

JOSEPH R. NEWTON, MD: We're now going to look in what we call the subcarinal space. This is underneath the windpipe. Roll the table away from me just a little bit, Dave. Thank you. That's great. The esophagus is right back here, or the swallowing tube. We're on the back side of the windpipe as it comes down the right main stem bronchus, what's called the bronchus intermedius, and then the air passages. It goes to the middle and lower lobes, which we've preserved. We're going to look back here because this is a very, very common place for lymph nodes to be. I don't know how well you can see this, but just deep to us right here is the back of the left atrium, or the heart. And we are separating some of the tissue from the lymph nodes. It is important to seal this tissue well to minimize any leakage of lymph or other fluid as patients recover, thus expediting patients' recovery. There are some drainage tubes that are placed at the end of the procedure that stay in for a day or two, but we'd like to get those out as soon as possible so that people can get home hopefully within three or four days after their surgery. If people have good lung function before the surgery, they will recover fairly quickly. They'll be able to be up walking, of course, within about a day of their surgery, short distances and then longer distances before they go home. We have some patients that are back to walking a mile or two a day about a week out after they've gotten home. So we're coming across this tissue, which contains actually several different lymph nodes. This is usually almost like a packet of lymph nodes. The pathologist will analyze each of them individually and give us a report. Again, the comprehensiveness of the center here is very nice in the sense that if you do need to have a
consultation with an oncologist, we arrange that before you leave such that you are -- the
game plan in terms of what additional needs to be done, if anything, is already set in
motion for you. Try to make this as easy as possible on the patient and their family. And
everything that you need is right here. Kirk, while I continue to work to get this out, you
might tell them a little bit about how we follow up lung cancer.

00:43:21
KIRK J. FLEISCHER, MD: Okay. Usually, in addition to a yearly exam, the minimal follow-up
after a resection of lung cancer is either two or three chest x-rays per year for four years
and then one thereafter each year. And the alternative now is alternating chest x-rays with
chest CTs every six months for four years and then once per year. Back to you, Joseph.

00:43:48
JOSEPH R. NEWTON, MD: Yes, good. We are close to -- I don't know if you can see on the
scope, too -- we’re close to getting this packet of lymph nodes out. They go very deep. They
actually go down to the windpipe or air passage that goes over to the left lung. We like to
be very, very thorough about this. If there are any cancer cells that have escaped the
primary tumor and are in these lymph nodes, we want to be sure we've gotten them out.
There you go. And you can see that subcarinal lymph node packet right there. Good. And
we’ll send that -- that's about 1 inch by 3/4-inch and probably contains about five or six
different nodes within that fat. Kirk, you might want to tell them now about the thing we
mentioned earlier about when tumors -- it's relatively rare, but when they grow into the air
passages, there’s a very specialized procedure we do here called a sleeve resection. And
that is worth explaining to our audience.

00:44:54
KIRK J. FLEISCHER, MD: Thanks. This is a bronchoscopic image that demonstrates a central
tumor that's growing into the airway. The sleeve resection that Dr. Newton spoke of is a
specialized procedure that is not commonly performed in smaller centers. It permits the
removal of the cancerous portion of the lung while sparing the normal lung tissue. This
illustration demonstrates one of the numerous variations on this procedure, depending on
the location of the tumor. There are some patients who would not tolerate the removal of an
entire lung and would not be surgical candidates with this technique. Expertise in these
lung-sparing procedures, even if the airway involvement is discovered at the time of surgery,
is another reason to seek a specialty center for your treatment. This postoperative
bronchoscopic image shows the suture line of a patient who underwent a sleeve resection.
And you can see the spared lung tissue beyond the suture line. Okay, Joseph, back to you.

00:46:13
JOSEPH R. NEWTON, MD: We like to do this in order to seal it well. It's rare for that to open
up, but it can cause a bad infection for the patient, and we want to do everything we can to
avoid that, so it's a double technique for closure there. We're using what's called a knot
pusher to push these knots down to the chest given the smaller incisions that we have.

00:46:37
KIRK J. FLEISCHER, MD: Joseph, I have a few email questions here that while you're tying
there I might answer. The first is, "Will this patient need any breathing apparatus since the
upper lobe was removed or will the patient be able to breathe on his own without any
apparatus after all the surgery and recovery?" One of the parts of the preoperative
evaluation is to determine whether the patient will tolerate having the part of the lung
removed. And some of the breathing tests we do can tell us with pretty good certainty that
a patient will tolerate having part of their lobe taken out. Dr. Newton and I often do the old-
fashioned test of running people up and down the stairway and see how they do with that,
and that often is as good or better an indication of whether a patient will be able to tolerate.
If they can do a couple flights on the stairs, they'll usually be able to tolerate having a
lobectomy. But if we didn't think the patient would tolerate having the resection, they would
not be considered a candidate for surgery.

00:47:33
JOSEPH R. NEWTON, MD: Kirk, one other thought there about that is we -- just so the audience understands, because of the things we do, the epidural catheter, and then in a minute you'll also see the rib lock that we put in, there's very, very high emphasis on pain control. And so these patients are extubated. In other words, the breathing tube is removed immediately after the surgery before they leave the operating room and they don't really have to worry about that part of the wakeup. Ninety-nine percent of our patients are breathing on their own before they ever leave the operating room, and that's how it'll be for this gentleman today, which is a very nice thing when the family comes back and visits the patient, which they'll be able to do about 30 minutes after the patient gets in the ICU. The patient will be sitting up, probably a little groggy from the anesthesia, but actually able to talk to them. And we don't actually run the patients up and down the steps, we walk them.

KIRK J. FLEISCHER, MD: Yeah, okay.

JOSEPH R. NEWTON, MD: Didn't want to scare anybody out there.

KIRK J. FLEISCHER, MD: No, that's for sure. The other question was the approximate size of the mass in the lobe. It was a little bit hard for us to see on the screen. I know we've looked at the scan, which showed about a 2-centimeter nodule. It looked at least that big today.

JOSEPH R. NEWTON, MD: I think that's right, Kirk. I think it was probably about 2-1/2, maybe in its longest oblong dimension 3 centimeters.

KIRK J. FLEISCHER, MD: Okay. Another question was is this procedure indicated in lung cancer for smokers? And that's really the primary patient population that we operate on. And it is -- it may be curative. The email asked whether it was complementary to other treatments. It may be curative and no other therapy is necessary. And the last question from Kimberly in Virginia, "I have an 8-year-old grandmother that has a 1-inch by 1/2-inch size spot cancer cell on her lung. No other cancer was detected by PET scan" -- PET scans are used to detect the presence of cancer cells in the mass as well as other areas -- "and her doctor stated that it was fairly small in size. She's now receiving chemotherapy to help reduce it. Would you consider a candidate for this type of procedure?"

JOSEPH R. NEWTON, MD: Well, potentially.

KIRK J. FLEISCHER, MD: Yeah. The decision to operate is really based on both objective criteria like the lung function but also on subjective criteria, the end of the bed look. Operating on hundreds of patients, you get a bit of a feel whether a patient will tolerate that. In this case, with the tumor being small and the PET scan being negative, we would standardly consider the patient to be a candidate for surgery. Age by itself is not a contraindication for surgery, but heart disease and the like may be one of the reasons she was not considered a candidate. We would need more information to make that differentiation.

JOSEPH R. NEWTON, MD: Kirk, is there anything else that we need to tell them about the lung cancer support group or some of the new trends that we're looking at?

KIRK J. FLEISCHER, MD: Yeah. Let's see, I've got a slide here for that. Let's put that up. Okay. Yeah, as part of the Sentara Thoracic Surgery Center, we've developed a lung cancer support group to help lung cancer patients and their families. The thoracic surgery center is constantly involved in new trends. Currently we've initiating a national trial called ILECAP, which is an ongoing trial that we're now joining to study early screening for lung cancer. We work closely with our oncologic and pulmonology colleagues to determine which patients
with advanced cancers might be candidates for preoperative adjuvant therapy. So I think those are the things that we're working on, and the emerging fields of genomics and proteomics may help us guide the treatment of our lung cancer patients in the future. Back to you, Joseph.

00:51:20

JOSEPH R. NEWTON, MD: We're back in the OR now. We're going to show you the nerve blocks that we put in at the end of the case to help minimize pain. Let's just focus right back there on the head of the ribs. We're injecting a little bit of what's called Marcaine, which is a type of anesthetic, very near -- not directly into, but very near the nerve roots. This works for people for about 18 hours or so. That couples with the epidural catheter that the cardiothoracic anesthesiologist placed gives us just really outstanding pain control. And that's just such a tremendous benefit to our patients. It's also good in circumstances where we really have very marginal patients and they really need to be able to take a big breath because their lung capacity may be fairly limited before they ever come to us. And so their ability to have good pain control and take a deep breath immediately after surgery is just critical in their early recovery and the success of their operation. Okay, that's good. We've got seven or eight of the ribs along there. Also, I usually inject a little bit right around some of the access port sites that we have placed. These two locations here will be used to place the drainage tubes that stay in, as I mentioned earlier, just about a day or so. That's good. Well, that's great. You know, maybe at this point, Dave, you could roll the table away from me. And let's reinflate the lung and show the audience how nicely that comes up. I find that patients and families understandably are worried about whether -- the terminology that the lung is deflated worried them, and I understand that, but the lung reinflates very nicely. And ventilation -- the anesthesiologist now, Dr. Schinderle is reinflating and blowing air into that remaining right lung -- pickups, please -- in both the upper -- sorry, both the middle and lower lobes are coming up very nicely. This looks just perfectly normal. And you can see just how nice that comes back up and reinflates. And we just do this -- yes, that's good. Now, sometimes we'll pour a little bit of warm saline into the chest cavity. And we really are checking to be sure that the lungs are sealed. Of course, we have to control the blood vessels like in any other type of surgery and make sure that there's no bleeding, but the unique thing about lung surgery is we've also got to make sure that things are airtight. So this is the old inner tube test. And basically, you just put a little bit of warm, sterile saline in the chest cavity and you look and make sure that you don't see any bubbles. And we don't see a one today, so that's just what we want. That's great. Dr. Schinderle, thank you. So at this point we can just ventilate normally on this lung. And we'll actually begin our closure. And I'd really like to thank our audience for joining us today. And on behalf of the Sentara Thoracic Surgery Center here at the Sentara Heart Hospital and the whole OR team, thank you for joining us and being a part of this case. And Kirk, I'll go to you and you can explain to our audience what we'll be doing over about the next 45 minutes as we really finish and close the case up.

00:55:21

KIRK J. FLEISCHER, MD: Thanks, Joseph. Nice work. We'll wrap up with a brief review of the completion of a similar procedure from a few weeks ago. There might be some repetitive because we really didn't know where we would be at the end of the hour. But once the lobe has been removed and sent to pathology, the camera is again inserted into the chest for final inspection of the staple lines to look for any potential sites of bleeding. The saline fluid test is performed to look to see whether there are any air leaks. Fortunately, none today because of all the expert work. Here we see the stump of the stapled airway after removal of the lung. Individually tied sutures are used to further reinforce the staple line. This is a belt-and-suspenders approach for this critical portion of the procedure. Fortunately, with this technique, a leak from the bronchial stump is extremely rare. The anesthesiologists who have been closely monitoring the patient throughout the case begins to lighten the patient's sedation so that he will awaken after the dressings are placed on the incisions. Dr. Newton
is also going to be continuing to biopsy additional lymph nodes, and the remaining mediastinal lymph nodes are removed, again, using the Harmonic scalpel. That's, again, used to reduce the risk of injury to surrounding structures. These are sent to the pathologist to determine whether any postoperative chemotherapy or radiation will be necessary. And you saw Joseph using the long spinal needle to infiltrate an anesthetic agent for the nerve block. That really helps with the postoperative pain for the first day and gives a little overlap for the epidural. Finally, prior to closure one additional safety measure is employed to reduce the risk of leak from the airway stump. Either a strip of muscle from the chest wall or some fat from the lining of the heart is secured to the bronchial stump. It provides more vascularity to that area so it continues to heal nicely. The chest tubes are inserted often through the holes that were used for the ports. Any fluid that may result from the surgery. And these procedures can only be successfully performed if one has a highly skilled operative team whose focus is on lung surgery on a daily basis. We are fortunate to have the synergy of a new state-of-the-art facility, combined with teams with many years experience working together focused on one surgery here at the thoracic center. In closing, I would like to thank Dr. Newton and the team for a beautifully performed procedure. And on behalf of myself and the many individuals that are responsible for the excellent care provided here at Sentara Thoracic Surgery Center, we thank you for joining us today and please feel free to contact us with the number provided. We can answer any of your questions and assist in your care. Good day. Thank you.

00:58:37

ANNOUNCER: Thank you for watching this minimally invasive lobectomy for lung cancer from Sentara Heart Hospital in Norfolk, Virginia. OR-Live makes it easy for you to learn more. Just click on the "request information" button on your webcast screen and open the door to informed medical care.
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