

Historically, lung cancer has been treated with a large incision between the ribs, and in the early-mid '90s we began to investigate uses of the laparoscope, which was used to do gallbladders and so forth, in the chest. So we began using the devices to do more limited resections with this and ultimately we were able to have instrumentation which has allowed us to do more anatomic resections, in other words a lobectomy and segments and so forth, with the video instruments – so-called video thoracoscopy.

Probably at this point two-thirds to three-quarters of my patients undergo a video-assisted approach and in the most recent Society of Thoracic Surgeons Database, which enters all of the information on lung cancer surgery for 500 centers in the U.S., it's around two-thirds of all of the resections are done this way now. We've watched that evolve from centers such as my own where we were islands that did this 12 to 15 years ago, now to the majority of centers have surgeons that are facile with the scope.

The advantage to the patients is obvious. If you don't have an incision on your side, you have two or three small holes of about three-quarters to half an inch, your recovery time is faster, less drainage from the tubes, home faster. I have people playing golf and tennis in two weeks, certainly everyone is driving in two weeks. What we found in a lot of the investigations we've done, not only that, if a patient has a larger tumor that requires adjuvant chemotherapy which is chemotherapy after surgery, sometimes there is a delay in the recovery of the patient because of the large incision, so that it delays their chemotherapy, and we've found with the video-assisted approach there is no delay and so patients are able to get their therapies on

time and are able to tolerate them better because they haven't had such a large insult.

Now not all cancers are able to be resected with a video-assisted approach, but I will say that in 2015 the vast majority are. We can do pneumonectomies or take out the whole lung with a scope, we can do surgery after chemotherapy and radiation – I just did one of those last week with a large tumor but we were able to do it with a scope. You can take out two lobes with a scope and you can do chest wall resections with a scope, so that's much less invasive.

So we've really reserved now, the large incisions for really large operations that require you frankly from a safety standpoint to have your hands in there. Our instrumentation is so good with the video-assisted technique that we're able to do it on lots of people.

The next question people ask is, "what's the difference between using the video thoracoscopy and the robot?" The robot has come along over the last five to six years as another potential instrumentation in a minimally invasive fashion you can use for patients. The robot does require several small holes but they're all holes about 1/4 centimeter each and the robot allows the surgeon at the console to really see things well. The video system that I use magnifies things about 3 times, and I'm at the table with my hands using instruments through small holes. With the robot it magnifies things 6 to 10 times and you have a virtual reality headset that you wear that really shows you things in 3 dimensions. What's nice about the robot hand, whereas my

sticks, I can only do this, the robot has a little wrist on it so it'll move in all directions inside the chest and some surgeons like that for its mobility.

In my center we have two surgeons that use the robot, there are three of us that use the video-assisted technique. We have the same results and I think the two methods are equivalent and I think that they are allowing us to do more things in smaller areas in patients, because frankly our goal is to remove a cancer and not hurt the patient. "First do no harm" is what we're all taught and these minimally invasive techniques have allowed us to do that. The other nice thing about it is that we have videos that the patients can watch and see the surgeries, see the incisions and see what's going to happen to them, and I think they're more informed when they make the decision of whether or not they would like to have a video-assisted approach for their operation.

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