KYLE HOGARTH: So this is going to be about-- this is a practical workshop. We're going to talk about endobronchial ultrasound, but a focus on, obviously, a specific needle. And this is obviously a program that's been brought to us by our friends from Boston.

The reason why there's a pathologist and a pulmonologist up here is precisely because, if you're doing any meaningful work in endobronchial ultrasound and with biopsies, you need to be having an active communication with your pathologist. So you're going to watch us actively communicate together here. All right, let's switch slides.

OK, why does all this matter? Well, I think this is no great surprise, but the paradigm has shifted, that a lot of lung cancer now is diagnosed and staged using small biopsy specimens or cytology. Look, you have various examples-- simple endobronchial biopsies or navigation or taking satellite aspirations from pleural fluid, et cetera, et cetera. The world has shifted for your pathologist. They were used to be given the entire organ, and then say, find the tumor or big chunks of lymph node. And now, you're giving them smaller and smaller things.

So we're going start with a case, just to kind of highlight things for all of us. You can't do a medical talk without an anecdote. So we got a 52-year-old lady, nonsmoker, came with a right upper lobe mass that was found. Incidentally, she went for the pre-op chest X-ray. An unremarkable exam, labs are unremarkable, and the chest CT is as you see there. We all agree it's pretty darned significant. I think watch and wait is on no one's thought process as to what to do next.

And no, this is not going to be some long drawn out discussion on what's the correct ultimate management here. But as you do evaluate her by chest CT, one of the things you should note, of course, is there's no obvious intrathoracic adenopathy present on CT. But when she does get a PET scan, there is at least some activity going on in the hilar area.

And so now what? Well, as you know, of course, lots of different guidelines are out there. But there's a relative harmony amongst them from the perspective that adequate tissue and specimen should be obtained to both tell us the histologic type of tumor and to perform a molecular analysis when applicable. No longer can you suck out five cells and someone say, that's non-small cell.

That was actually adequate enough back in the day. Jeff's job was to say small cell or non-small cell. That was it. That's definitely changed and evolved. And you're not doing your patient a service if you're not trying to stage them at the same time. How many of you would have sent this patient first for a needle biopsy of the mass?

The problem with the needle biopsy, forget safety and anything like that, you haven't staged your patient. I don't know anything about the mediastinum yet. So biopsying of course, a pathologic site that would confer the highest possible stage is of the utmost importance. And obviously, with that PET scan, for sure, there's at least a high concern that the hilum's involved or worse, right?

Again, not my little shtick, lots of different professional organizations and societies have stated the same thing, that people with a high suspicion of N2 or N3 involvement, by either a lymph node enlargement or a Pet uptake, the needle technique of endobronchial ultrasound is recommended over any surgical staging at best first test. Think about that again. The use of endobronchial ultrasound has dramatically shifted what you and I do, our opportunities for our patients. When's the last time you sent someone for mediastinoscopy? And there's a reason why this is a superior technology.

We obviously know the lymph nodes that you and I can get. This is a reminder of the classification of lymph nodes. This is something that my colleague, Dr. Murgu, who's my partner at University of Chicago, they've published. And there's actually this and many other publications have free and available. I always encourage people to have something like this as a poster in their bronch suite, simply as a reminder anatomically, especially if you do listen to the chest podcast that I do, the one we just talked about in regards to people's difficulty in correctly identifying lymph nodes, especially since certain lymph nodes have clear staging implications.

We decided to take this patient to EBUS. So we do a full staging. So this was a right-sided mass with a potential right hilar involvement. So we start contralateral, and we went after 4L. As you can see there, it's not very large, nestled in there between the aorta. The pulmonary artery is there, trust me. It's just offscreen a little bit. Jeff, what did we find?

JEFF MUELLER: For the benefit of those that don't get to see what the pathologist sees, this is an example of a benign lymph node smear. The cells, it's mostly nuclei, very little cytoplasm. There's a ton of cells. It doesn't look like just peripheral blood.

And in the middle-- well, scattered throughout, you see this black pigment. That's also evidence that we're in a lymph node. That's anthracosis, which is carbon pigment from smoking, pollution. Anyways, that's very common to see in these nodes, and that's evidence that we're sampling the lymph node. So this would be an adequate pass.

KYLE HOGARTH: And most importantly benign, so we've moved on from 4L. Obviously, three passes, three separate reviews that it's negative for tumor and positive for lymphocytes. So along those lines, Jeff, this comes up frequently. So then we moved on to station 7. Here's what it looked like. It really wasn't very enlarged either, as you knew from the CT scan. And Jeff, what did we find?

JEFF MUELLER: So here's another example of a benign lymph node smear. All of this right here, this is peripheral blood. For those that have not seen this, these small, dark nuclei are lymphocytes. Those are what you see in normal peripheral blood. These real pale circles in the background that are the same size as the lymphocytes, those are red blood cells. So that would be just peripheral blood.

The rest of it is lymph node. You can see the lymphocytes are all approximately the same size and shape. They're discohesive. They can clump a little bit, but they kind of spread out, like you're seeing here. And there's also anthracotic pigment within this. So this is, again, an adequate lymph node smear.

KYLE HOGARTH: All right. And then we went to 4R. And this was important, too, because 4R was not PET active. And it actually has the central hilar structures that are relatively typically indicative of benign phenomena in the sense of almost a central fat within the lymph node. But of course, we sample it, and it's not very enlarged. And Jeff.

JEFF MUELLER: This one, in contrast to the level 7 node that we just saw, this one, there are these large cohesive clusters and sheets of cells. And the lymphocytes in the background are the really small, dark-- this is a different magnification. So these nuclei are much, much bigger than lymphocytes. This is what an example of a smear of tumor looks like. And the cells form these cohesive sheets and clusters.

This picture has approximately 1,000 cells on it. So we'll talk about molecular later, but a couple thousand tumor cells is all we need to do the whole NextGen sequencing panel. So this slide, if it all looks like this, would have enough to do all the molecular--

KYLE HOGARTH: Right. This is one frame, but obviously, there's an entire slide of zooming around. So immediate feedback, so we've made a diagnosis. We've also staged, upstaged this person from their clinical staging, right? They had N1 node involvement by PET. N2 nodes were not involved, and yet, by biopsy, indeed they are.

And importantly, not only the knowledge that you have a lung cancer, now what stage you're at, but then, the ability to run all of the molecular tests. And again, we'll have slides on that in a minute. And so in one bronchoscopy, you've gotten everything that you and your oncologist are going to need to help manage this patient.