Discussion to: Robotic Navigational Bronchoscopy in a Thoracic Surgical Practice: Leveraging Technology in the Management of Pulmonary Nodules

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Discussion to: Robotic Navigational Bronchoscopy in a Thoracic Surgical Practice: Leveraging Technology in the Management of Pulmonary Nodules

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Invited Discussant: Dr. Philip Linden, MD²

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Dr. Philip Linden (Cleveland, OH):

Thank you, Dr. Brownlee, for a very nice presentation and to your group for its fine work. The work is a retrospective review of 503 nodules, biopsied in 407 patients using shape-sensing robotic bronchoscopy. Complications occurred in just 5% of patients. The diagnostic yield was 87.8%. A one-year mark of nodule stability is used to radiographically conclude that a nodule is nonmalignant but may be inadequate as most clinicians and most studies have used two-year stability for nodules. 37 patients underwent robotic resection during the same anesthetic with a very low complication rate and an acceptable overall benign resection rate of 16%. The mean operative time was 253 minutes. The diagnostic yield compares favorably to the 69% value in the prospective worldwide Navigate study of nonrobotic navigation bronchoscopies in 1,400 patients performed by a variety of clinicians, specialists with varied levels of experience. I have three questions. I'll ask them one at a time. A diagnostic biopsy is typically considered one which yields a malignant diagnosis or a specific benign pathologic diagnosis such as granulomatous disease. Your paper describes four categories: malignant, infectious or inflammatory, atypical, and insufficient sampling. Did you classify atypical cells as diagnostic or nondiagnostic? And what pathologic characteristics define a benign diagnosis?

Dr. Andrew Brownlee (Los Angeles, CA):

Thanks. I think these are both really, really important questions. So, one of the things that we developed over the course of the study period was how we were going to classify these atypical findings. If it was atypical and not otherwise specified, that was considered nondiagnostic. Our pathologists, on five different occasions only, looked at the atypical cells and they found atypical cells concerning for malignancy. All of those patients went on to undergo a subsequent diagnosis or anatomic resection, and those were confirmed as malignancy, and those actually were classified as diagnostic. In terms of how we define diagnostic, this is a really interesting topic. I think as we're seeing more and more studies come forth with navigational bronchoscopy technologies, there's been a large variation in the way in which we define a diagnostic biopsy. Diagnostic is obviously the combination of true positive and true negative. And it's really the true negatives that have varied substantially throughout the literature. Dr. Tim Murgu from where I trained, University of Chicago, published a paper recently suggesting that there's essentially three ways you can go about it. And one is the way that you describe, where essentially on the day of the biopsy, if you see a granuloma, then you can safely say that that is a benign process.

An intermediate approach is for those nonspecific benign findings, that you do follow them long-term. And that's what we chose to do for a number of reasons. I think that in terms of looking at how you're going to use this technology in a practical longitudinal clinical program, a lot of these patients are going to be followed long-term, and that's a practical approach. But they do need to have
long-term follow-up, as you say, and so we used one year. And then we also demonstrated that if there was resolution or repeat biopsy confirming the diagnosis, that those were also confirmed to be diagnostic. In our series, we actually have 20 patients who have not met maturity yet in the benign group. And so those actually went into our nondiagnostic group. So, we were trying to be as conservative as possible with that.

Dr. Linden:

I'll just ask one more question so that other people can perhaps ask questions. The bronchoscopy time was 67 minutes, mean operative time, 253 minutes, maybe [inaudible] for an EBUS. How do you justify the efficient use of OR time if doing a biopsy and you may have an empty four-hour block of OR time left open?

Dr. Brownlee:

So, it is a very important question. So, as you say, four hours is the combination of the entire procedure. So, biopsy, pathologic evaluation, EBUS if indicated, and then surgical resection. And so that's wheels in, wheels out. If we stopped, it was in a minority of patients, only 4 patients out of the 41, so just around 10% of cases, and so it's minimal. However, the way we justify it is, we do also compare it to the situation where a patient would be undergoing a VATS wedge. So, they would get a wedge, you would have a benign diagnosis, and then you would ultimately stop prior to performing an anatomic resection and your OR time would shift. We're very aware of that, and as soon as a case, for example, is stopped at a benign diagnosis, we're working to shift our OR schedule to compensate for that additional time. Thank you so much.

Unidentified Speaker 1:

Nice presentation. I have a quick comment and a quick question. So, the comment is, don't sell yourself short on the impact of what you're doing and your early slide of 20,000 lung nodules a year. That was only at Kaiser Permanente, Southern California. It extrapolates to about 1.6 million a year across the nation. So, you're tackling a big problem. The question is, for patients who have an indication for EBUS, do you do the EBUS first and tackle the nodes, or do you go after the nodule first?

Dr. Brownlee:

So dependent on the case, if there was a very high index of suspicion for metastatic disease to the mediastinum, they typically would not be consented for the single-anesthetic biopsy and resection. Usually, we would want to wait for the pathology to come back as a final path. If there was an indication for it
based on size criteria with, for example, a negative mediastinum or questionably mildly PET-avid nodes or mildly enlarged, we would do the biopsy first, await the pathology, and then do the EBUS afterwards.

Unidentified Speaker 1:

Nice work.

Dr. Brownlee:

Thank you.

Unidentified Speaker 2:

Great presentation. Very thought-provoking. As technology improves and diagnostic yields improve, the question is always how to implement it. So, at your institution, are you doing this for every patient?

Dr. Brownlee:

No. So there's a number of different workup and treatment pathways. And there are certainly nodules that we will look at, albeit the minority, that may be more amenable to a CT-guided biopsy, or they may already come in having gotten one. But in general, I would say as the study period progressed, we became more and more confident with our ability to biopsy more peripheral and smaller nodules. It doesn't flesh out in the statistics. That's why I didn't mention it. We've also recently started using a Cios Spin, which allows us to do sort of a CAT scan in the operating room for the more difficult nodules, so becoming more confident with that. However, there still is a very busy interventional group that's doing biopsies as well.

Unidentified Speaker 2:

This is also a question for the room, actually. I'd love to know how many of the audience would resect a nodule without a tissue diagnosis, versus just doing a VATS wedge. I follow the criteria of, if it looks like a duck, walks like a duck, and quacks like a duck, I'm not going to believe a negative biopsy. I'm probably going to take it out. But then again, everybody's practice patterns are different. How many insist on trying to get a biopsy before operation? Can you just show hands? Got a couple of people kind of raising their hands, so. Okay. That's helpful.

Dr. Brownlee:
I mean, it's a very good point. I think the goal for us has been to try and reduce the benign resection rate to as low as possible.

Unidentified Speaker 2:

Do you know what your rate was before you implemented this protocol? Was it really high?

Dr. Brownlee:

No. It was probably standard. It's like 15 to 20 percent range. But you'll see in the last 20 cases, we were at 5%. And we may kind of settle in that area. I think an important point here is understanding the technology. We would get potentially benign biopsy results on the pathology, but we were kind of unsure whether to believe them or not, and we would go on to resect. And then they were confirmed on resection in a few cases. And so, we started to shift to stopping more cases based on a benign finding on the biopsy.

Unidentified Speaker 2:

Okay. Thank you.