First Do No Harm

Case Presentation:

- 92-year-old female
- Previous 40 pack year smoker who quit 35 years ago
- Complained of back pain, right rib pain and dyspnea for 4-5 weeks
- 8-10 lb weight loss over the same time
- Productive cough, no hemoptysis

Diagnosis:

- Metastatic disease as seen on CT and PET scan-diagnosed as stage IV lung cancer
- Long discussion ensued with the family
- Hesitant to have an invasive procedure for diagnosis or treatment

Molecular Testing and Test Results:

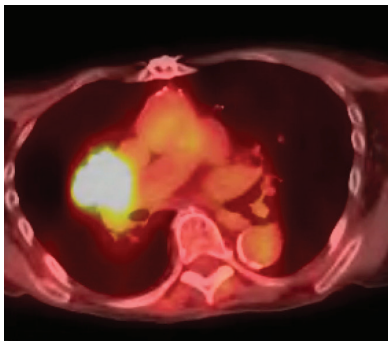
- GeneStrat® result: KRAS mutation G12V positive
- VeriStrat® result: Poor
- Follow-up appointment scheduled four days later

Patient Treatment Plan:

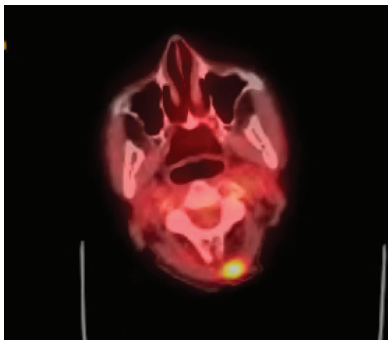
- Doctor had the difficult conversation in delivering the poor prognosis and asked patient and family how they wanted to proceed.
- As there were no targeted therapies available and chemotherapy might not work and have negative impact on quality of life, the patient and her family decided against pursuing a biopsy and oncology referral.
- Patient and family thanked doctor for talking honestly about her options and avoiding unnecessary treatment and burden.

Patient Outcome:

- At time of publication, patient was at home in palliative care.



Patient PET scan



Multiple brain metastases, one identified in this PET scan

Key Considerations

- Biodesix Lung Reflex® identified a VeriStrat Poor result and KRAS mutation, indicating unfavorable prognosis.
- Genomic and proteomic results provided critical information for determining treatment.

LIQUID BIOPSY RESULTS TRANSFORM LUNG CANCER PATIENT CARE

Michael Pritchett, DO, MPH
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President, Society for Advanced Bronchoscopy

Can you tell me a bit about your practice?
I'm affiliated with a private, multispecialty group practice at Pinehurst Medical Clinic, a community hospital. In addition, I am the Director of Thoracic Oncology at FirstHealth of the Carolinas. I'm a pulmonologist and see a broad group of patients for asthma, COPD, and pulmonary hypertension. I also perform the vast majority of the thoracic oncology work-up in addition to all of the interventional pulmonology procedures such as navigation, stents, and valves.

How do you integrate liquid biopsy into your practice?
Many of my peers draw for Biodesix Lung Reflex® (BLR) for every biopsy. I have started by drawing if a patient appears to have advanced stage lung cancer. However, I think we certainly may start using the test in more early stage testing.

With the BLR test results specificity at 100%, we are confident in the results and make our treatment recommendations based on these positive results. In addition, it has stimulated interesting conversation between myself and medical oncologists within my group as the test provides both proteomic and genomic patient information.

How do you share the diagnosis and prognosis with your patients? Do you talk about potential treatments?
The ultimate decision about treatment is left to the discretion of our expert medical oncologists, but I like knowing the different treatment options available. This enables me to give my patients an idea of what is next for them. I've previously used results to recommend patient placement into the RTOG-1306 clinical study. For another patient that had a solitary brain

metastasis and was EGFR mutation positive, I recommended treatment with osimertinib as it has good CNS penetration. For another patient that tested ALK mutation positive, I told him to wait another week for treatment as I knew alectinib was going to be released. I wanted to make sure he was placed on the best treatment option for his mutation type.

Do you use VeriStrat® results when you are talking with patients?
I do! I separate the VeriStrat result into two talking points. The first part is that the data provides prognosis on the patient's expected overall survival rate in terms of months. The second part is how the results indicate they will respond to traditional platinum-based chemotherapy. I include this information in my notes and our medical oncologists can choose to use this information in their treatment decisions.

Do you refer all your patients to oncologists?
Our referral pattern depends on staging. If they are stage I, they don't need to see a medical oncologist. For patients with advanced disease whom we refer onto medical oncology, it's my goal to have the patient completely staged, with molecular and PD-L1 testing, before they walk into the oncologist's office. I want to make sure that when the patient sits down with their oncologist, they have the BLR test results available at their consult. The patient has some relief when they see their oncologist and have answers. It's a huge let-down, not to mention a delay in their care to say "Yes, this is stage IV cancer just like Dr. Pritchett told you, but without molecular and PD-L1 testing results available, I can't offer you any treatment recommendations today. We need to send your tissue for more testing and this usually takes a few weeks." I might not always have their tissue results back, but I get their blood-based results completed. If a patient's Genestrat® results are negative and they have enough tissue, I get their tissue testing scheduled immediately.

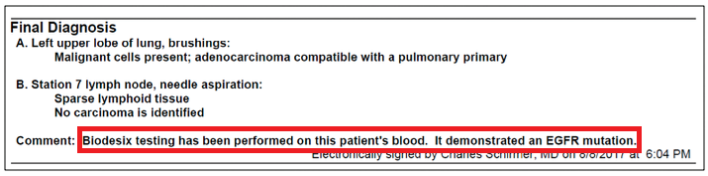
How many medical oncologists do you refer to? Do you make the decision who to refer to?
We have five medical oncologists in our group and they are all very up-to-date on thoracic oncology. Its nice to have a strong group that are all excellent at what they do.

Can you explain a bit more about your multi-disciplinary tumor board?
Our multi-disciplinary tumor board consists of pathology, radiology, pulmonary, thoracic surgery, medical oncology, clinical trials, case workers and navigators. We meet every Tuesday.

What information do you bring to the meeting?
For every patient reviewed in the Tumor Board, my nurse navigator creates a sheet that includes the patient's entire history. We keep track of every single patient, what their biopsies say, what their surgical results are, what their pulmonary function tests (PFTs) were. Some patients have a paragraph, some patients have an entire page. Pathology is notified ahead of time, so they can bring cytology images for review at the meeting.

We always try to have the BLR results available for the Tumor Board meeting. As soon as the result comes in, it's immediately

faxed to the pathology department and they put it into the pathology report.



Final Diagnosis

A. Left upper lobe of lung, brushings:
Malignant cells present; adenocarcinoma compatible with a pulmonary primary

B. Station 7 lymph node, needle aspiration:
Sparse lymphoid tissue
No carcinoma is identified

Comment: Biodesix testing has been performed on this patient's blood. It demonstrated an EGFR mutation.

Electronically signed by Charles Schirmer, MD on 8/8/2017 at 6:04 PM

How important for you is time to treatment?

For me it's tremendously important, as it impacts my patients who are my top priority.

What was the biggest hurdle in implementing the BLR testing strategy into your practice?

Initially we had some resistance from our oncologists. Some of this was due to their being unfamiliar with liquid biopsies and another component was their perception of us infringing upon their responsibilities. However, once positive results started coming in they quickly realized the value of a positive liquid biopsy result. In those cases with a negative result, they follow up with tissue testing.