Cancer Pathology

Scott Redding: Welcome to the 3Ps of Cancer Podcast, where we'll discuss prevention, preparedness, and progress in cancer treatments and research. Brought to you by the university of Michigan Rogel Cancer Center. I'm Scott Redding.

We're here with Michigan Medicine, assistant professor of Pathology, Aaron Udager, to talk about pathology's role in cancer diagnosis. Welcome, Aaron. When someone gets diagnosed with cancer, usually it comes from an oncologist or surgeon, but really are pathologists the ones making the diagnosis?

Aaron Udager: Well, in a sense, yes, because it's a pathologist's job to generate the official reports of cancer diagnoses, which are then distributed to other clinicians and the patients. But really like everything in modern medicine, cancer diagnoses are really a team effort. In fact, for a pathologist to make an accurate diagnosis, they often need additional information that is only provided by oncologists, surgeons, radiologists, et cetera. It's really a team effort.

Scott Redding: If this is like a team, and most patients spend time either seeing their oncologist or their surgeon or the radiation oncologist, do they also get to spend time with a pathologist?

Aaron Udager: Not typically. I think pathologists sort of traditionally have worked behind the scenes because of a lot of what we do doesn't require that face-to-face contact with patients. I think sort of the old adage was that the pathologist was the "doctor's doctor", and we were often sort of the person that we were most commonly interacting with directly were other physicians or other doctors.

And so I think kind of, historically or traditionally, patients haven't interacted directly with their pathologist, but certainly things change. And I think we've seen more recently that there's sort of an increasing interest in patients reaching out to communicate with their pathologists and maybe understand more kind of what is going on or what's sort of in the report that the pathologist would generate.

Scott Redding: How do you put that report together?

Aaron Udager: The whole process, I think that might kind of help kind of illuminate this a little bit. When a patient has a biopsy or they undergo surgery and cancer tissue is taken out, that tissue is then sent to the pathology laboratory where we process it in order to produce glass slides, which can then be examined in really fine detail using a microscope. Most of the time, all we need are the slides, a microscope in our eyes, but sometimes we also need to perform additional special tests in the laboratory that can tell us more about a patient's cancer.

Once we look at the slides and gotten the other additional tests that we need, we tend to size all that information. And again, thinking about other information that's been provided to us by other members of the patients sort of clinical care team. And then we sort of put that into reports that have a couple of really

standard fields, and the most important field for most patients and for physicians is the diagnosis field.

And so the diagnosis field is the field that contains information about what the actual diagnosis is, so what type of cancer it is, those types of things. Oftentimes, we also provide additional information in the reports, something called a cancer template, and that has more detailed information that may be used by a surgeon or an oncologist to decide what are the next sort of steps in treatment. And so when we sort of finish that report, then we finalize it and make a digital copy of it. And then that digital copy is sent out into the electronic medical record for the physician or the patient to view

Scott Redding: I have an issue where I am starting to notice blood in my urine and I go see a urologist, and there's potential suspect of it being bladder cancer. How do they go in and get the biopsy to get it to you? Or what does that process look like from me going in to see a doctor to a diagnosis?

Aaron Udager: Sure. Yeah. I think that's a good question. The urologist sort of would evaluate you and decide that they're worried that you may have bladder cancer. And so then they take a special camera that they can use to go actually investigate your bladder and look for any tumors or anything else that might be suspicious for cancer. And that special camera also has an instrument that allows them to take a biopsy of anything that they're worried about, like a tumor or some other area of bleeding or something like that. Then they take that biopsy and they send it to us, to the pathology laboratory. And we then process that biopsy tissue into glass slides so we can then look at under a microscope.

And when we look at it under the microscope, based on sort of our understanding of what kind of normal tissue looks like and what tumor tissue looks like, we can then tell the urologist and the patient whether that tumor or that area that was suspicious for tumor is benign, meaning not cancer, or whether it's bladder cancer. We can also then tell them additional information about is the bladder cancer, is it invading into the tissue of the bladder, is it high grade or low grade? And these are all things that the urologist can then use to decide what the next step in clinical management for a patient is.

Scott Redding: Do pathologists focus on one subspecialty like oncologists, surgeons and radiation oncologists?

Aaron Udager: Yeah. I think it really depends. Like all doctors, there are a lot of different practice models or ways that they practice. At bigger hospital systems like Michigan Medicine, pathologist usually focused on one or maybe two subspecialties. For example, I specialize in genital urinary pathology, but I also do head and neck pathology. On the other hand at some smaller community hospitals, pathologists may not specialize in one particular area and instead may do a little bit of everything, kind of like the general practitioner you may see at your local clinic. Really, there's a lot of different sort of models out there.

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Scott Redding: One of the topics that we are covering here on the 3P's of Cancer Podcast is around advanced and metastatic cancer. How do you determine from a pathology standpoint when someone gets a biopsy whether it's an early stage or advanced cancer?

Aaron Udager: Sure. Yeah. That's a really interesting question because one of the things that I find really intriguing about cancer in general and it's one of the reasons that I became a pathologists in the first place is that really there are often very few differences in the way that a tumor looks when it's an early stage tumor or when it's an advanced tumor. That's not always true. Sometimes there are differences and you can see those differences under a microscope.

For example, I do a lot of prostate cancer research and I can tell you that if you just gave me sort of an image of what the tumor looked like under a microscope, I couldn't tell you necessarily whether it was from an early stage, low grade cancer or a really advanced metastatic cancer. I think this is where we often need to rely on additional information that's provided by other members of the clinical team, including radiology reports, understanding where the biopsy was taken, maybe treating information from the oncologist. Is this the patient that's gotten some sort of treatment for their cancer? But in the end, we can't always tell those differences just by looking at what the tumor looks like under the microscope.

Scott Redding: I've heard, as it relates to at least prostate cancer, the ability to do RNA and DNA testing. How does that relate into a pathology report, if it does?

Aaron Udager: Yeah. And so I think kind of thinking about the question that we just were talking about is how do you distinguish between kind of early stage, low risk cancers and kind of later stage, maybe metastatic tumors, a more advanced disease. And some of these tumors, as I said, don't really look that different, but we know from lots of research that's ongoing both here at the university of Michigan or Michigan Medicine and elsewhere, that there are differences in the types of DNA and RNA changes that we see in those tumors. I would say we're kind of just at the beginning of really the personalized medicine revolution in pathology where we're routinely getting additional information about RNA and DNA changes out of a specific tumor so that we're able to incorporate that back into the pathology report.

Right now our pathology reports are really focused mostly on, what can we see under the microscope? What are maybe some other tests that we can do in the laboratory? But we're not routinely getting that information about RNA and DNA changes. I think in the future, definitely, that's very much definitely going to be a part of the routine pathology report. And I think that's going to be a really interesting time, and I think it's going to be able to help us make better diagnoses as well as treating clinicians make better or more informed decisions about how to treat a patient's tumor.

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Scott Redding: We've talked about biopsy, and you getting the information to go on the glass slide and looking at it under the microscope. How quick of a turnaround is it normally for a diagnosis?

My dad had been diagnosed with Stage IV oral cancer a few years back, and they knew it pretty quickly when they took the biopsy. I want to say within that same visit time. They did it right when we got there, and we were there for an hour and a half or so that they kind of had an idea. And I don't know if it was based off of the location of the tumor or whether it was the size of it or what, but how quickly does it normally take for cancers to be diagnosed from the pathology side?

Aaron Udager: I think it really depends. For biopsies, we typically, our goal for kind of turning around the report, and so it's sort of from the time that the biopsy was taken to sending out a final report that's available in the electronic medical record is three business days; and I think we're pretty good at getting that. Again, sometimes when we need additional special tests, it may delay the report for a day or two. But typically, we get it done within two days and then we can sort of shoot for three days.

Now, it sounds like from what you were talking about in your dad's case is that there's a really kind of a special thing that pathologists do, which is called a frozen section diagnosis. It's really a totally different workflow than kind of our typical workflow. And it has some advantages, but also has some disadvantages. The advantages are, it can provide very rapid information. In these cases, when we do these frozen sections, it typically takes 20 or 25 minutes. The disadvantage of that is that we're often not able to sample all areas of a tumor and we're not able to see the tumor cells as well always.

And so I think it's useful in certain cases. It's useful during a surgery to help a surgeon guide their surgery, so to try to understand where the tumor is and to make sure that they get all the tumor out of the patient during surgery. And then it's also useful in, sort of in your dad's case, these times the patient presents with a tumor or a mass, it's suspicious for cancer, and they want to know right away in order to sort of begin to decide what treatment to do for a patient. And so that's less common I think, but that's probably what happened in your dad's case is that they sent some tissue from his clinic visit, we processed it in our frozen section laboratory, got a really quick turnaround time like 20, 30 minutes, and then there was sort of the diagnosis. I would say that in those cases that's just a preliminary diagnosis and we still issue a final report that's often available two or three days later.

Scott Redding: We've talked about a few things that seem kind of interesting, and I don't want to say high tech, but RNA, DNA, even the frozen section topic. What kind of research is happening around pathology and the future of pathology and diagnosing cancer?

Aaron Udager: This is a really interesting area, and I think a lot of the focus on research and pathology is on developing new laboratory tests that can help pathologists make better diagnoses, provide additional information to clinicians about the aggressiveness of a patient's cancer, and [inaudible 00:14:58] guide selection of cancer treatments. There's also sort of a whole field in pathology devoted to just better understanding the types of DNA and RNA changes that are occurring in these tumors and why those might be related to the formation of cancers.

My laboratory, for example, really explores how the results of some of these new laboratory tests may be similar or dissimilar across different areas of a patient's cancer. It's something that we talk about as cancer heterogeneity. I think that's an area of research that is very interesting because I think it does have the potential to impact the type of information that we're able to provide to clinicians and patients.

I think one other really important and interesting area of research right now is kind of the emerging use of artificial intelligence and digital whole slide images to improve the accuracy of cancer diagnosis. I think the way that this is envisioned right now is not necessarily sort of replacing the pathologist in making cancer diagnoses, but providing the pathologist with additional, really powerful tools to help make their diagnosis better. And so I think that's an area that could be really interesting over the next five to 10 years.

Scott Redding: Aaron, I really appreciate the time. As we wrap up, if a patient wanted to review as his or her pathology report, what would be the steps to do that? And what would be a final takeaway of our talk today for patients or caregivers?

Aaron Udager: I think it's a really good question. I think, as I sort of mentioned before, I think, we, as pathologists are kind of used to working behind the scenes, but I know that our department in particular is very interested in providing opportunities for patients to communicate directly with their pathologists, maybe to answer questions about a report. And even if it's something that's of interest to a patient, providing ways or finding ways to connect them with the pathologist so they can actually review what's on the glass slide and how that relates to what our report is.

I don't think that we have any really good solutions yet, but I think we're definitely working with it on a case-by-case, on a patient-by-patient basis. And I think that if it's of interest to anybody, I think they should definitely just getting in touch with the Department of Pathology and kind of saying, "Hey, I'm interested in talking to pathologist about this report." They're usually able to find us. Another option would be to communicate with your treating clinician and then they could connect you to the pathologist.

I think really the take home here that I'd like to, sort of again, is pathologists, although we're sort of kind of a behind-the-scenes member of the team, we are part of this larger team effort. And I think we're working to improve the type of

information that we can provide to clinicians and to patients to help improve their cancer treatments.

Scott Redding: Great. Well, Aaron, again, I really appreciate the time today and thank you.

Aaron Udager: Yep. Thank you, Scott.

Scott Redding: Thank you for listening and tell us what you think of this podcast by rating and reviewing us. If you have suggestions for additional topics, you can send them to cancercenter@med.umich.edu or message us on Twitter @UMRogelCancer. You can continue to explore the 3P's of Cancer by visiting rogelcancercenter.org.