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Investigating the Role of Micro-CT in Imaging Breast Cancer Specimens

Announcer:
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Dr. Birnholz:
This is ReachMD. I'm Dr. Matt Birnholz. I have the pleasure of being joined by Dr. Ankur Tiwari, who is a surgical resident over at, uh, University of Texas San Antonio.

Dr. Tiwari, welcome to you.

Dr. Tiwari:
Hi, thanks. Thanks for having me.

Dr. Birnholz:
So I was struck by your poster presented at SABCS devoted to the role of micro CT in imaging breast cancer specimens. Can you tell me, Dr. Tiwari, how did you come into this study, and who was the—the main objective?

Dr. Tiwari:
Yeah, so, uh, this study is interesting for multiple reasons. And, first of all, let me start by saying that the concept itself is actually one of those, uh, hidden-in-plain-sight solutions I would like to say because the technology of micro CT, although new to medicine, by itself is not exactly new, so it's been—it's been being used for a while in, uh, in fields like material science, archeology. Uh, archeologists use that to get 3D images of uh, you know, uh, specimens like archeological, uh, artifacts, and, uh, material science people use it to look at cracks in buildings, and they have been using it for a while, uh, and so the genius of this concept is just to apply that to, uh, medicine.

Uh, the way it works is that it's essentially x-ray-based. It's a CT scan, but it works on the principle of having the specimen very close to the x-ray source and to the, uh, to the—the field, the receptor, giving it a very high resolution. It will not be feasible otherwise in live patients, but for excised specimens this is a perfect—perfect tool to analyze.

Dr. Birnholz:
Fascinating. And it sounds like it was a process just being able to, uh, convince the medical field to move in on this particular technology for this particular application. You came in on this study over at Massachusetts General Hospital several years into, uh, the—the study and got right in when it started getting really good, if you will. Can you tell me about that process for you?

Dr. Tiwari:
Yes, exactly. So this was, uh, more than the convincing. It was just a matter of putting—putting the two together. You had this... And so it took, uh, Dr. James Michaelson, PhD, over at Harvard Medical School and Mass General, who has his hands in multiple projects, to bring the 2 fields together essentially and think of this, uh, think of this project. And so it started off back in 2012 when they started imaging, uh, previously excised lumpectomy specimens using the micro CT and analyzing the image to see if they can, uh, get an idea of how it correlates to the pathological analysis. I came into, uh... I came into this project, uh, in 2018 as part of a—as part of me being, uh, a research assistant over at the Mass General Surgical Oncology, uh, Division, and this was one of the projects that I got involved in. Uh, where I came in was when most of the scans had already been done, and it was, uh, it was the analysis part of it, specifically the 3D analysis of it, uh, which I—I kind of, uh, worked on and, um, took it to the—took it to fruition so to speak.

Dr. Birnholz:

And speaking of fruition, maybe you can talk to us a little bit about what that looked like as far as being able to actually apply this imagery to the specific task at hand.

Dr. Tiwari:
Mm-hmm, exactly. So, uh, what we were heading towards or what we were going for was to get good 3-dimensional images of the specimens, uh, because what we... The—the concept or the goal with this, uh, study is to overcome some of the inherent deficiencies in our current, uh, practice, uh, which is basically using pathology slides to look at, uh, look at the specimens and figure out whether or not we got the whole cancer or not, uh, and that—that's been the gold standard for—for a while now. What we... What the inherent deficiencies in that is A) it takes—it takes a while to get those results. Um, pathologists would fix the specimen and then analyze it under the microscope. It would be at least a week before you get the results. This is a 10-minute scan that you could do, uh... You know, you take out the specimen; you can do right then and there in the operating room. Uh, the second limitation that we are trying to overcome is how, uh, pathology—sort of histopathological analysis is 2-dimensional, and we're going 3-dimensional with this, uh, which adds another dimension literally, uh, to the whole analysis, and so, if you're looking at, uh... If you're looking at the cancers—cancer within an excised specimen and we're worried about whether or not we got it all, uh, we really need a 3D image to figure out if we got it all or not, uh, and using micro CT, what we've been able to do is look at the 3D image and figure out where exactly in the specimen is the cancer closer to the edge or, uh, is it completely surrounded, and that's—that's kind of what we're going with.

So this was—this was the goal of the study, and I think we've accomplished that to—to a pretty good extent. Still work to be done, still a new, uh, concept so to speak, but I think it's a good, good start.

Dr. Birnholz:
And to put it in another way, this is diving into territory where pathology slide analysis cannot go. Is that correct?

Dr. Tiwari:
Yeah, exactly. I mean, pathology slide analysis is—has its own, uh, merits and has its own, uh, place in—in, um, you know, in the management of, uh, cancer. Uh, it's been the gold standard for—for a long time, and I would still consider it to be a gold standard, uh, just for the fact that it's extensive and thorough, uh… But like I said, the inherent deficiencies of it, uh, primarily being the time it takes and, uh, the 2-dimensional capabilities, limitations of it, uh, are what we're trying to overcome, and this takes it to, uh, where pathology can—cannot go essentially because it's quick and gets you the 3D image.

Dr. Birnholz:
So, Dr. Tiwari, where do you see this technology and its applications going for breast cancer management in—in the future?

Dr. Tiwari:
I—I think this is a very promising modality. I would consider… As of now where it stands, I think it's ready to be used at least as an adjunct, probably not the be-all and end-all of lumpectomy analysis just yet, still work to be done, still, uh, still physics to be figured out as to how, uh, how the cancers look, the radiographic physics so to speak, and that's actually the direction we're heading in or the group is heading in, uh, next, uh, but even as it stands, I think it—it will be a very useful adjunct, uh, to the existing sort of algorithm of how we manage because this would—this would give you information in realtime and—and pretty useful information which is visually easy to look at, um, and should potentially help the surgeon, uh, right then and there to figure out that, "Oh, yeah, there's something left there; let's get that."

Dr. Birnholz:
Certainly makes sense. And as a rising surgeon yourself, uh, do you envision being able to potentially use this in realtime for oncological surgical applications?

Dr. Tiwari:
Yeah, that would be the goal. That would be the hope with this technology going forward. Uh, the timeline exactly when this would, uh, come in would—is still up for debate with medical... Uh, you know, any—any medical innovation there's a sudden inertia involved which takes a while, but I think this study would be—is a great start. Uh, going forward, most studies like this would, uh, just prove, uh, prove the point. And then I think, you know, essentially, the more data that you gather, the more easier it is to convince people to get on board, and so I think that's the way forward for this, and I do hope this comes into, uh, active clinical practice.

Dr. Birnholz:
Well, I've been speaking with Dr. Ankur Tiwari about the role of micro CT in imaging breast cancer specimens.

Dr. Tiwari, it's been a pleasure talking to you.

Dr. Tiwari:

Thank you so much. Thank you so much.

Dr. Birnholz:
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Announcer:
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