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Radiological Society of North America Update

IMAGING MODALITIES AND RELATED MOLECULAR AND INFORMATIONAL TECHNOLOGIES

It is and has been the world's largest annual medical meeting, The Radiological Society Of North America. I am Dr. Jason Birnholz and I attended the 94th annual RSNA in Chicago along with some 62,000 attendees from all over the world. We learned from more than 4000 scientific papers, posters and special focus sessions. I spoke first with Dr. Michael Welch from the Mallinckrodt Institute in St. Louis who gave the annual new horizons relation. Then I spoke with Dr. David Weinreb from Saint Raphael Hospital in New Haven, Connecticut about emergency in critical care uses of a new portable CT scanner and then I spoke with Dr. Rizwan Aslam from the faculty of radiology department of the University of California, San Francisco on a technique for getting quantitative bone density information as a routine part of conventional CT exams. These 3 interviews illustrate directive research on the brink of becoming a major advance in tumor diagnosis and treatment, bringing a CT scan to a critically ill patient instead of transporting the patient to the equipment and a technique for increasing diagnostic information retrieval from a routine CT scan. There have been progressive advances in all the imaging modalities and related molecular and informational technologies. From my own perspective as a clinical radiologist, the most important drive for improvement in our services always begins with a period to period dialogue between the physician managing care and the consultant radiologist about what is best for the immediate needs of the individual patients.

DR. JASON BIRNHOLZ:

My first guest was Dr. Michael Welch. Dr. Welch, thank you very much for joining us. You have picked out of the entire world just today to give the new horizons lecture and you spoke about nano particles. Can you tell us a little bit about that?

DR. MICHAEL J. WELCH:

Yes, I was asked to give an overview of the technology known as nano technology in imaging, but actually nano technology is important for drug delivery, the delivery of all sorts of drugs as well as imaging. What I mean by nano particles are particles that are very small and like obviously the word nano does indicate that they are very small, that you are probably 2 meters tall, that the sorted particles I was talking are nanometers tall from 10 to 100 nanometers tall, so that's almost a billion the size of your height and the advantage of using these very small particles as I pointed out in my talk is the smaller you get in a particle or even a cube the greater the surface area, if you sort of take the same volume and have a cube and then split it into 8 cubes, then split it into 64 cubes, the surface area increases significantly, so this means you can put all weaker functional groups on to this particles and the smaller the particle gets the more functional groups you can put on, so the ultimate nano particle for using medicine and there are such particles such as being used in preclinical studies is a particle that is made in a totally controlled chemical way, so all the particles have exactly the same size and shape. This is a major advance, one of the major excitements that nano technology. Inside the particle, you might add the therapeutic, so it could be a cancer drug. Then on the outside of the particle, you can attach something that keeps the particle in the circulation and you can design it, so it keeps the particle in the circulation, for the sort of time you want, the <_____> to accumulate, via for the drug to release. You can then put what we call targeting groups on, groups that target a receptor or an antigen on the tumor surface. You can

put a group on that will take the particle into the cell, particle to transduction peptide that carries the particle into the cell and then you can put on it an agent that can be used for imaging via a magnetic resonance probe, a probe for CT or a nuclear probe for patho SPECT imaging. So the advantage of nano particles is this unbelievable multi-functionality where you can have a drug, you can have all these other functions that assist in the drug delivery.

DR. JASON BIRNHOLZ:

So it sounds like in some ways it's like a non-replicating virus.

DR. MICHAEL J. WELCH:

That's a very good point, because actually the most nano particles that people are building if you look at the size, they are virtually the size of nano particles, so your analogy is actually perfect.

DR. JASON BIRNHOLZ:

Thank you very much, that was fascinating.

Next I spoke with Dr. David Weinreb, from Saint Raphael's Hospital in New Haven. Dr. Weinreb, hello. Thank you for joining us. I wonder if you want to tell us a little bit about portable CT and why this is a new and special thing.

DR. DAVID WEINREB:

Well, at the hospital where I was working, one of the major challenges that we faced when treating acute stroke patients is that it often took a very long time from them to get a head CT. When a patient arrives into the emergency room and they are presenting with signs and symptoms of acute stroke, it is absolutely necessary that they get a head CT as quickly as possible and due to the availability of CT at our institution this was a big challenge for us. We are finding that would often take as long as 40 minutes between when the patient would arrive and when we could complete the head CT. During my time at that hospital, we acquired a portable head CT scanner and it was dedicated for use, exclusively in the emergency department. By having this new technology, we were able to scan patients from the ED much faster. Based on our research we believe that this could have very significant impacts on the care of acute stroke patients.

DR. JASON BIRNHOLZ:

Well let me ask you a few questions. You started out by saying stroke patients, so I presume that you are also doing vascular studies as part of this, it is not just plain CT, but you are perfusing the material choice in watching inflow and outflow, is that true?

DR. DAVID WEINREB:

That's right. I mean the technology, it has the capability, not only to do non-contrast CT, but also CT angiography and CT perfusion. Those are also imported modalities in terms of the whole package for imaging of the stroke patient, but really the most important thing in the acute setting is making sure that there is no hemorrhage within the brain. This can really be best accomplished in the most time

efficient fashion with non-contrast imaging. So the first and greatest priority is to make sure that these patient's get a non-contrast study as quickly as possible. If there is no hemorrhage they could be candidates for TPA. The other modalities such as angiography and perfusion, they have a role, but the most critical thing is as I said non-contrast imaging.

DR. JASON BIRNHOLZ:

And that would be head trauma patients too, also.

DR. DAVID WEINREB:

Hmm. This does have an important role that could play for patients presenting with head trauma to ensure that there is no delay in getting them to the radiology suite for imaging. They could be imaged at their point of care in the emergency department with portable CT imaging.

DR. JASON BIRNHOLZ:

Oh, so you wheel the CT device right to the patient's bed, or do you take them to a special place in the emergency room.

DR. DAVID WEINREB:

At our institution, the way we have it setup is that the patient is wheeled about 8 or 9 feet from their bed in the emergency room to a special coupe within the ER where all imaging CT and radiography are performed. At other institutions, it can be used in the ICU setting as well. At our particular institution, we did not use it for that application, but many other hospitals are doing that. In those cases, they wheel the CT scanner directly to the patient's room within the ICU and perform the imaging at the patient's bedside without moving the patient at all.

DR. JASON BIRNHOLZ:

Really great, thank you.

DR. DAVID WEINREB:

Thank you very much.

DR. JASON BIRNHOLZ:

The next discussion was with Dr. Rizwan Aslam from the University of California at San Francisco. Hello.

DR. RIZWAN ASLAM:

Hello.

DR. JASON BIRNHOLZ:

Thanks for joining our audience.

DR. RIZWAN ASLAM:

Thanks for inviting me.

DR. JASON BIRNHOLZ:

Your papers here at the RSNA is entitled, assessment of bone mineral density on CT colonography and you want to tell us a little bit about what motivated your study?

DR. RIZWAN ASLAM:

That's a very good question, I mean, <_____> base, we have been doing CT colonography for several years. We get great studies, you know it is also known as virtual colonoscopy and the patients are getting a complete body CT scan and so as well as the information that we are getting about the colon, the rest of the abdomen and bones that we can look at and so we came up with the idea, I mean people have looked previously at extracolonic findings, you know looking on the CT scan.

DR. JASON BIRNHOLZ:

Like aortic aneurysm.

DR. RIZWAN ASLAM:

Aneurysms, renal cancer, all these are the things that you can see that you would not with a standard optical colonoscopy and so we thought that you why don't look for osteoporosis, we scan the patient, the CT date is there, all we need to do is crunch the numbers, look at the dates in a different way and hopefully it can give us some answers.

DR. JASON BIRNHOLZ:

Okay, so you are not just eye balling the spine and saying this is not quite as tense as it should be, you are quantitating this.

DR. RIZWAN ASLAM:

Sure, we use the software package called BMAP, which is provided to us by Philips. The BMAP is short for bone mineral analysis package, that is what they named it, the software is based on the study that were performed in the 90s, looking easing CT to assess bone mineral density and especially what they did was they used intrinsic soft tissue density as a guide to assess the bone density so they looked at the muscle density and they looked at the fat density, which are fairly uniform throughout the population and they used the stand from that you could extrapolate the bone density and on that is essentially how the software operates.

DR. JASON BIRNHOLZ:

Oh, very good. So in the sense, this is something that may be available to anyone doing abdominal CT.

DR. RIZWAN ASLAM:

Exactly right and you know previously people have used abdominal CT to assess bone mineral density. I mean this is a slightly different technique from QCT or concentrative CT where patients have much lower dose CT examination to assess bone mineral density. Usually that requires the Samson, but here what we thought was these patients are already been scanned, they don't need any more scanning, we have the data, we have the scans, we just need to look at it in a different way to get some more information.

DR. JASON BIRNHOLZ:

In your study, you showed that you had exactly identical or comparable values to DEXA scans.

DR. RIZWAN ASLAM:

Definitely, I mean these patients, you know previously had DEXAs. We have their bone mineral density values and the CT results were very comfortable and they probably would have stopped a set of similar treatment measurements.

DR. JASON BIRNHOLZ:

Do you have any idea by the way if the standard of looking at lumbar vertebral bodies is actually the best one or there are other bone things that you happened to have looked at adventitiously, that perhaps looking at the part of the pelvis or some other part of the spine?

DR. RIZWAN ASLAM:

I mean potentially, if we note further avenues of future research, I mean like the software we used and the study we do and we looked at the lumbar vertebral bodies, preferentially the idea was to look at L2, L3, L4, but the advantage of CT is that, you know, if any of those levels with either increased sclerosis or the compression fracture you can go to the level above or below, so you have enough levels to look at where you may have difficulty with other techniques and also because of CT we can accurately place our region of interest, the bone that we measure, the trabecular bone is that we are interested in and so we can specifically just target the trabecular bone where as in DEXA studies, you are looking at the whole vertebral body, so you will pick up areas of sclerosis, facet joint hypertrophy which may reduce the validity of the results, with all the potential for further recess, but on a set of early analysis, you know, the results look very good.

DR. JASON BIRNHOLZ:

Now it is interesting that you picked CT colonography because this is becoming more and more a primary screening method, which means that people may have multiple studies every few years as opposed to one CT ever and then they are gone, cured and so this sounds like also potentially a way that you can follow people over time and identify the emergence of osteoporosis.

DR. RIZWAN ASLAM:

Precisely, I mean that is exactly the point. I mean the populations at risk are very similar, so the similar range of, you know once patients are above 50 they need to have a Kerlone screen. Once patients are above 50, they are at risk of developing osteoporosis particularity women have triggers on steroid or other such treatments and that is essentially why these patients, they are going to be screened for colon cancer, they are going to have a CT scan and therefore, you know the pick is that they could be screened for osteoporosis at the same time, using the same data, no more radiation, just you know probably small amount of additional time and relatively less additional cost compared to having a DEXA study just done on its own. This software of this process is not going to replace DEXA, because that is a much lower radiation technique, but this is, you know, what we are looking at CT colonography and these patients are getting whole extra study, you know, for no extra radiation and minimal additional cost.

DR. JASON BIRNHOLZ:

Well, thank you very much.

DR. RIZWAN ASLAM:

Thank you very much.

DR. JASON BIRNHOLZ:

I am Dr. Jason Birnholz. Thank you for listening to conference highlights on ReachMD, XM160, The Channel for Medical Professionals. Be sure to visit our website www.reachmd.com featuring podcasts of this and other programs.