3D Ultrasound in Gynecology

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By Eric Blackwell, MD [1]

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Dr. Eric Blackwell: "I'm Eric Blackwell, I'm the Co-Editor of the History of Ultrasound section along with Joan Baker for OBGYN.net and the Society of Diagnostic Medical Sonographers. We're coming to you this time from the 45th Annual Convention of the American Institute of Ultrasound in Medicine in Orlando, and I'm pleased to have with me Dr. Leeber Cohen from Northwestern University in Chicago. I know Dr. Cohen has interests in gynecology and especially gynecologic oncology and three-dimensional acquisition of gynecologic information. I'd like to ask you first something about how you became involved in ultrasound. How did you first take an interest in ultrasound itself?"

Dr. Leeber Cohen: "When I graduated from residency in 1984, I actually went off into private practice and decided that wasn't for me. Then in 1987 when I came back to Northwestern, my chairman asked me in which area I would like to develop an academic interest and I told him I'd like to really do ultrasound. At that point he arranged with Dr. Sabbagha, who's well known in the field, to allow me to work in his lab part-time. Over the next three to five years I spent more and more time in ultrasound until about 1995, I had a part-time appointment there and as of two years ago I'm full-time in GYN ultrasound."

Dr. Eric Blackwell: "Could you tell us a little bit about some of your current projects and what you and your fellows and staff are up to?"

Dr. Leeber Cohen: "Right now we're spending a lot of time looking at the role of ultrasound in detecting early ovarian cancer as well as looking at refining our ability to say whether the adnexal mass is malignant or not, and we're exploring how 3D enters into that area. We're presenting an abstract at this AIUM meeting, which looks at 71 masses that have gone to the OR that have been evaluated with power Doppler prior to surgery. What we have found is that there is an improvement in our specificity to detect whether a mass is malignant or not malignant by the addition of the power Doppler to traditional grey-scale imaging."

Dr. Eric Blackwell: "Is 3D a part of this study as well?"

Dr. Leeber Cohen: "Yes, it is."

Dr. Eric Blackwell: "Is the power Doppler acquisition associated with 3D or is that a separate process?"

Dr. Leeber Cohen: "The power Doppler could be done in 2D, it can be done in 3D, and I think it would add similar information. Our preference is just to do it in 3D because the whole volume of the mass is interrogated for flow in one volume rather than having to do sequential cuts in two perpendicular planes so I think it just makes it more systematic, and that's the major advantage. What we're really looking for is the presence or absence of central flow within solid areas or excrescences within tumors and, as an example; if you were looking in an adenofibroma it's obviously a complex tumor that's mainly cystic. It may have an excrescence that's coming into it, and if the excrescence doesn't have flow, there's a very, very high probability that you're dealing with a benign tumor. So although on 2D grey scale it may look like it's potentially a malignant process, when we look at it with power, if we don't see flow we re-categorize it as a benign mass. Our study essentially showed that the specificity over grey scale imaging improved from about 50%-70%, and we were dealing mainly with complex masses as second opinion ultrasounds."
Dr. Eric Blackwell: "With the 3D part of this that you've been working with, have you been in it long enough to see a change in the ability of the equipment and has that made any difference in your approach to the study?"

Dr. Leeber Cohen: "I think that the 3D technology is rapidly evolving. It used to be that there was fairly good 3D on the machine that we used but the 2D was pretty marginal. The 2D grey scale resolution is getting better and better and it also has the 3D capabilities that are automated and built into the machine. So I think that within the next couple of years we're going to be at a point where 3D is going to be routinely on machines available and there's going to be both high quality 2D as well as 3D imaging on these machines, and I think it's going to revolutionize this industry."

Dr. Eric Blackwell: "You'd mentioned also that you currently have a project involving brain volume evaluation, is that correct, in fairly early pregnancy?"

Dr. Leeber Cohen: "We actually are presenting an abstract at this meeting looking at just normative values for the fetal brain cross sectionally during pregnancy. As an offshoot of that, we looked at the ability to do orthogonal cuts of the fetal brain at 18-22 weeks and what we found is that with transabdominal ultrasound we're able to get a midline sagittal cut of the brain at 18-22 weeks about 40%-50% of the time with the older 3D technology, and not that which is available today. The beauty of that is you can see the entire corpus callosum, you can see the complete cavum septum pellucidum, and you can see the relationship between the third and the fourth ventricles and the cerebellum. I think it helps you define anatomic defects in the head like you had an MRI or CT in front of you, and to me that's one of the most exciting things. We no longer have to try to do a transvaginal transfontanel 2D cut and try to get that image that way because a large percentage of the time we're going to be able to get it by just doing a volume, and that volume actually can be obtained axillary at the level of the BPD which most people know how to do. You're going to get the coronal and the sagittal cuts and be able to scroll through all those with this one volume which is obtained in just a few seconds so this to me is really a revolution."

Dr. Eric Blackwell: "This is mind boggling to me because I started out in the era when we were using A-mode to look at the biparietal diameter with just spikes, not even an image, just looking for two spikes from the oscilloscope. So the evolution from that to the grey scale to now 3D acquisition and now apparently with equipment that does the acquisition rapidly enough to make it more realistic to use in a day-to-day setting is very exciting."

Dr. Leeber Cohen: "The other thing on top of that is with the real-time live 3D scanning now they have a refresh rate of 16 times per second which means that it actually looks like real-time 3D. You can rotate the 3D image just like you have a hologram and look at the fetus from any angle, and that technology is really starting to get to the point where it's going to be clinically applicable because we're going to be able to take a fairly young fetus 13-14 weeks, get one volume set, and then spin the baby and look at its arms and its limbs and look for omphaloceles and gastroschisis. We'll also have the orthogonal imaging at the same time so I think that the whole era of prenatal diagnosis is going to be moved backwards to earlier gestation, and I think that's something which is very exciting."

Dr. Eric Blackwell: "Yes, I think that's right. You mentioned Dr. Sabbagha, were there other people who you consider as mentors as far as the ultrasound end of gynecology and obstetrics?"

Dr. Leeber Cohen: "Most of my training in ultrasound came through him. I also worked with Dr. Tamura but really a lot of what I do in GYN ultrasound was dependent on other people that I interfaced with. I worked a tremendous amount with Dr. Valle who's a very, very well known endoscopist and with the AAGL - the American Association of Gynecologic Laparoscopists. Also, I obviously worked with Dr. Sh-are-ah who's internationally known in contraception and fertility issues and everything else and he really pushed me a lot in ultrasound so I'm very, very grateful to both of those people."

Dr. Eric Blackwell: "Excellent."

Dr. Leeber Cohen: "The other person who I really have to thank a tremendous amount is Dr. David..."
Fishman who's the Director of the National Ovarian Cancer Screening Program. It's been the greatest opportunity of my career because I'm able to really look at what the role of ultrasound should be in ovarian cancer screening. I think it's something, which has been misused and a little bit over-hyped in the past, and I think we're really defining what the proper role of ultrasound should be. I regard that really to be the highlight of my career to this point."

Dr. Eric Blackwell: "Dr. Cohen, thank you very much for taking the time to talk with us."

Dr. Leeber Cohen: "It was my pleasure."

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