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Endoscopic Imaging Optics for Assessing Dysplasia

ENDOSCOPIC IMAGING OPTICS FOR ASSESSING DYSPLASIA

You are listening to ReachMD XM 157, the channel for medical professionals. Welcome to GI Insight, where we cover the latest clinical issues, trends and technologies in gastroenterological practice. GI Insight is brought to you by AGA Institute and sponsored by Takeda Pharmaceuticals North America. Your host for GI Insights is professor of medicine and director of the Digestive Disease Center at the Medical University of South Carolina, Dr. Mark Delegge.

The popular practice called the technique of biopsy inside the body. The technology now is used to perform microscopic imaging of living cells inside the digestive tract. Joining us to discuss endoscopic imaging optics for assessing dysplasia is Dr. Thomas Wang Assistant Professor Of Medicine in biomedical engineering at University of Michigan School of Medicine.

DR. MARK DELEGGE:

Welcome Dr. Wang.

DR. THOMAS WANG:

Thank you.

DR. MARK DELEGGE:

Thomas, I look at this as a GI doc, I love new toys and new tools, but the first thing I have to ask you, what is microscopic imaging of the GI tract through an endoscope called and exactly how does it work.

DR. THOMAS WANG:

The microscopic imaging is the ability to visualize at a cellular and even a subcellular level and what were are starting also develop the ability to see molecular properties, which is even finer in detail through the endoscope, so essentially be able to take the function of microscopes that we typically seen used in the lab, which are very large and sit on top of laboratory benches and we are through technological developments been able to reduce the size of these instruments so that they can be passed through a medical endoscope use to see inside the human body.

DR. MARK DELEGGE:

So, in fact, you are getting a microscopic image that were used to see through a microscope on the video imaging.

DR. THOMAS WANG:

Yes that is correct. Essentially, as we perform endoscopy to look at the digestive tract and cell and tissues on the surface of lumen of the esophagus, colon, small bowel, stomach we can see in real time the features of the cells and tissues wide and be able to study and understand their function.

DR. MARK DELEGGE:

Thomas do you have a special name for this device or this technique.

DR. THOMAS WANG:

Well there has been a number of different names given to it, I tend to refer it to as molecular imaging, others refer it to as endomicroscopy, I have heard microendoscopy used as well, but they feel essentially the same thing as we are looking at the life or behavior of cells and tissue inside the body.

DR. MARK DELEGGE:

Now from a practicing gastroenterology standpoint, I realize that this is a new tool and a new field, but what would a practicing gastroenterologist do with this technology, one impact that it has.

DR. THOMAS WANG:

Well the major impact is to help the physician determine which regions of the tissue would be of greatest value to better understand the surface area of the digestive tract whether the esophagus, stomach, small bowel, or colon. When you unravel it is extremely large, it in size perhaps of a ping-pong table for example. If you were to do a biopsy you only remove about a 16th of an inch of a tissue, so there is a lot of area that you are actually missing. If you are able to visualize the cells and tissues live. You would have a way of focussing on areas that would most likely be the disease enhanced; improve your ability to perform diagnosis of diseases that are present.

DR. MARK DELEGGE:

We do a lot of disease management currently as gastroenterologist what we call screening, we will say for a Barrett esophagus or for dysplasia or cancer in patients with inflammatory bowel disease, I think this tool, this microscopic imaging would be very important in those disease states.

DR. THOMAS WANG:

Yes, it really would be, right now we have gastroenterologist are essentially limited to doing random biopsy to try to find a small foci of dysplasia, which is really comparable to trying to find a needle in a haystack . If we have techniques of imaging that help guide us we would be able to find the problematic areas much more easily.

DR. MARK DELEGGE:

I have got to ask this question. I know as a gastroenterologist, when I see new tools and techniques come out, I am always worried about training and most gastroenterologists, we have some training in pathology and some training in looking into the microscope. How do you think it will work with microscopic imaging, the training of the gastroenterologist, not so much the new fellow who is coming in, but perhaps the person who is already out practicing?

DR. THOMAS WANG:

I think the techniques that were developing today in the lab is to try to take the subjectivity out of the interpretation images so that minimal training will be needed. For example, when there is that I am developing, I think it has tremendous potential is the use of peptides that will bind to molecular targets on the cells and tissues and the peptide are labeled with the fluorescent dye so that we can provide a more objective and quantitative way for the gastroenterologist that is doing the procedure, so that when we see the area on the image that lights up then that would then target the biopsied cell. The endoscopist would not need to actually interpret sizes and shapes and different morphological features that could require a lot of training to do.

DR. MARK DELEGGE:

I take it that you see this or may be I am putting words in your mouth as becoming kind of a sub-specialization of gastroenterology, do you think it will become part and parcel of what everybody does.

DR. THOMAS WANG:

I think if the techniques and methodologies can be simplified, they can be easily done by the community physician in outpatient clinic that do a lot screening say for dysplasia in the setting of Barrett's or ulcerative colitis.

DR. MARK DELEGGE:

This is a new device obviously and whenever there is a new device, there is the FDA getting involved with regulatory hurdles for the device actually to get to market. Today, I am assuming that I cannot just go out and buy one of these microscopic tools to be used with the endoscope. What is happening with the FDA and FDA approval?

DR. THOMAS WANG:

Well there are already a couple of commercial instruments that are available, one is focal microscope that has been developed by Pentax and the other is one developed by _____ Technology. They both have either PMA or 510k approval. Some of the molecular regions that on developing will be through investigation of the grog application that will be used to keep records just to make sure that the molecular probes are actually safe for human use. Big advantage of developing this imaging technology in the digestive tract is that it is non-sterile environment and very costumed to encountering peptides, which are protein fragments and thus they really in very limited concern for local reaction or systematic toxicity since the peptides are actually topically applied.

DR. MARK DELEGGE:

So, what I am hearing is, you as that it may not be just or only having a look at a piece of tissue and say that is the dysplastic, that is highly dysplastic, that is cancerous, or perhaps moving more in direction in peptides binding to the surface and identification of where those binding are sites are.

DR. THOMAS WANG:

That is the feature of this field. It is that dysplasia is traditionally a qualitative diagnosis made by the pathologist based on a number of morphological features of the cells. Over the past 10 to 20 years, we are seen a tremendous explosion in our knowledge in understanding molecular markers that were assigned significant risk when they are over expressed on the cells and tissues to the extent that we can visualize this endoscopically will tremendously enhance our ability to risk stratify and perform early diagnosis and also to monitor therapy in patients who may have developed cancer or precancerous condition of the digestive tract.

DR. MARK DELEGGE:

Some more of a targeted biopsy.

DR. THOMAS WANG:

That is correct.

DR. MARK DELEGGE:

What about financial reimbursement. I know it is early to talk about the device having a PMA or 510k, which pre FDA approval types of terms. For reimbursement even today at my university center and academic center, I am still being held accountable to what we spend and what we can charge the patient and such. What you see on the financial reimbursement side of this either now or for the future.

DR. THOMAS WANG:

Well I think for now that would be something that will need to work through, but as these technologies and techniques mature and demonstrate its efficacy and safety the procedure will openly be considered by CM&MS for an ICD-9 code , which some of this procedure can be reimbursed by Medicare.

DR. MARK DELEGGE:

Do you see someone having to completely replace their entire process on an endoscopy equipment or would this be something that could be used along with what they already have?

DR. THOMAS WANG:

We are working here at the University of Michigan with level of the major endoscopic companies that are looking forward to the next decade of the endoscopic imaging and we should be able to incorporate a lot of the same basic imaging platform that already exists in the clinic.

DR. MARK DELEGGE:

There are a lot of other technologies that I have seen and in fact some that are being used now for such as narrow banded imaging. I have done some chromo endoscopy where I am sitting near with a spray catheter spraying a dye on tissue trying to see if it changes colors or perhaps has some other change and I have heard about autofluorescence, which basically is having a kind of an optical filter on the scope to try to pick up abnormal tissue. Would you consider these technologies competing technologies or very different than what we are talking about here with the microscopic examination.

DR. THOMAS WANG:

I think these technologies that you are referring to are really a different class of technology. They have certain advantages in that the techniques either use intrinsic signals of the tissue and a lot of dyes, but the biggest difference between these class of imaging techniques and some of the ones that I am developing and other people in the field is that the spasticity of the detection, so with narrow banding, chromo, there is inherent lack of spasticity for the cells and tissues that are being imaged and furthermore there is no molecular properties of the cells and tissues that are being highlighted whereas some of these other fields that I and other investigator are involved in really try to examine the molecules that are expressed by the cells and tissues to help us with the detection and diagnosis of disease.

DR. MARK DELEGGE:

Tom, we anxiously await all your contributions to gastroenterology. I would like to thank my guest from the University of Michigan School of Medicine Dr. Thomas Wang. Dr. Wang, thank you very much for being our guest this week.

DR. THOMAS WANG:

Ok, thank you Mark.

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