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REFERENCE

1. Kubo T, Imanishi T, Kitabata H, et al. Comparison of vascular response after sirolimus-eluting stent implantation between patients with unstable and stable angina pectoris, a serial optical coherence tomography study. J Am Coll Cardiol Img 2008;1:475–84.

REPLY

Developments of drug-eluting stent and intravascular coronary imaging have dramatically changed interventional cardiology. The case reported by Drs. Motreff and Souteyrand demonstrated the contribution of optical coherence tomography (OCT) to precise diagnosis during coronary intervention.

In the past decade, intravascular ultrasound (IVUS) has played an important role in understanding failure and optimizing outcome in stent treatment. However, due to its relatively low resolution, IVUS does not provide detailed structural information. The OCT uses advanced photonics and fiberoptics to obtain images and tissue characterization on a microscopic scale. The resolution of the OCT is 10 to 20 μm, which is approximately 10 times higher than that of IVUS. Compared with conventional imaging modalities, OCT has a superior ability to visualize stent malapposition, tissue protrusion, and vessel injury after stenting as well as thin tissue coverage of individual stent struts at follow-up (1). Nevertheless, the clinical relevance of these small, detailed features identified by OCT has not been determined yet. Assessment for the clinical reliability of OCT guidance in coronary intervention warrants further investigation.

An inherent limitation of OCT is the need to occlude coronary artery by balloon catheter and to flush Ringer's lactate solution for image acquisition. The coronary occlusion limits evaluation of left main or ostial lesions of the major coronary arteries. And the time constraint imposed by blood flow interruption limits assessment of long coronary segments. To overcome the vessel occlusion blood removal technique, an alternative method based on nonocclusive infusion of isosmolar contrast media has been proposed as a safe and effective method (2). The newly proposed method simplifies the previous complex occlusive technique, leading to a marked reduction of procedural time.

Recently, the second-generation OCT system has been shown to be an enabling technology with 15 to 50 times faster image acquisition rate than that of the currently available OCT system. This capability is made possible by a new detection method called Fourier-domain OCT, frequency-domain OCT, or spectral-domain OCT. In combination with a short, nonocclusive saline flush and rapid spiral pullback, the higher frame rates generated by second-generation OCT enable imaging of the 3-dimensional microstructure of long segments of coronary arteries (3). Moreover, the use of this method facilitates the acquisition of spectroscopic and polarization data for tissue characterization. When the second-generation OCT system is fully exploited, it might provide new insights into the treatment of coronary artery disease.

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REFERENCES

1. Kubo T, Imanishi T, Kitabata H, et al. Comparison of vascular response after sirolimus-eluting stent implantation between patients with unstable and stable angina pectoris, a serial optical coherence tomography study. J Am Coll Cardiol Img 2008;1:475–84.
2. Prati F, Cera M, Ramazzotti V, et al. Safety and feasibility of a new non-occlusive technique for facilitated intracoronary optical coherence tomography (OCT) acquisition in various clinical and anatomical scenarios. EuroIntervention 2007;3:365–70.
3. Tearney GJ, Waxman S, Shishkov M, et al. Three-dimensional coronary artery microscopy by intracoronary optical frequency domain imaging. J Am Coll Cardiol Img 2008;1:752–61.

Seeing or Hearing to Believe, or Both?

I have read with great interest the insightful editor's page of the September issue of *iJACC* (1) which states that physicians will be imagers, with imaging becoming a mainstay of physical examination, diminishing the need for relying on stethoscopes. "Only seeing will be believing!" and thus, the traditional models of teaching will change subsequent to this cultural change.

I cannot help but respectfully disagree with this vision of imaging technology possibly being the bridge of interaction between 2 human beings, one of whom is exposing his/her body and mind with all their imperfections, miseries, fears, and hopes to another who must use all his/her senses in an orchestrated manner to conceptualize illness and deliver personalized care. I picture an environment in which the cardiovascular examination of a patient is worthless unless the "pre-condition" of a bedside hand-held echocardiogram has been previously obtained. The concept is much more worrisome in light of the existing corporative "push" of technology use by for-profit-driven entities. Furthermore, how does this imaging future apply to less-fortunate nations and patients who do depend on their physician's auscultatory and physical exam competence for their well-being? And what will happen to the time spent face-to-face

with the patient when we can do without the time spent in auscultation?

I certainly envision a new cardiovascular physician well versed in all imaging technologies, cost-effectively applied in the quest for the safest and most effective treatment plan of a patient, but I also envision this technology making physical examination teaching much more effective: i.e, what better way to teach a medical student, at the bedside, to hear a Austin-Flint murmur or the presence and timing of a mitral opening snap, then to see (on bedside ultrasound) the aortic regurgitation jet impinging on the anterior leaflet of the mitral valve and the pliable, mobile appearance of the mitral diastolic opening, respectively? Recently, a colleague sent me a patient for a transesophageal evaluation of suspected significant mitral regurgitation after a nonrevealing transthoracic echocardiogram. I listened to the patient and agreed to do it only to find a very eccentric, commissural jet of significant mitral regurgitation which would have gone undetected if my colleague did not know how to hear a holosystolic blowing murmur suggestive of it. Yes, it was advanced technology leading to the diagnosis, but it was careful auscultatory art leading to appropriate use of technology. Auscultation technology has also evolved (2) and promises to remain a critical part of the armamentarium used in physician-patient interaction, both for the detection of disease and for the sake of the interaction itself.

As physicians treating patients and teaching students, we cannot watch disease only, we have to smell it, touch it and especially, hear its music.

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REFERENCES

1. Chandrashekhar Y, Narula J. *iJACC* in the Evolving World of Integrated Imaging: A Spectator, a Follower, or a Trail Blazer. J Am Coll Cardiol Img 2008;1:691–3
2. Tavel M. Cardiac Auscultation A Glorious Past—And It Does Have a Future! Circulation 2006;113:1255–9

REPLY

We thank Dr. Michelena for raising an important issue in response to the Editor's Page (1). Being from a sandwich generation, having master clinicians as our teachers and technology-focused fellows and residents as our students, we ourselves cannot but be nostalgic about the lost art of the clinic examination. All of us have had success stories in which we made bedside diagnoses that would have made our master teachers proud. However, in far many more cases, we also remain acutely aware of our limitations at the bedside. The world of medicine is moving on very briskly and relying exclusively on a very restricted view of what a good clinician can use at the bedside (the touch, the smell, sound, and feel as beautifully described by Dr. Michelena) or cannot use in a complimentary fashion (imaging) is, in our view, unhelpful.

Dr. Michelena's premise is possibly based on subscribing to rather inelastic boundaries for a traditionally defined clinician. In some ways this suggests and "us versus them" scenario; ownership of history and physical exam (and using the stethoscope as its final elegant instrument of proof) to the exclusion of other easily available tools (used by imagers in their dark laboratories and not by clinicians at the bedside). This we feel is an artificial distinction and would argue that easily available imaging is a natural and complimentary extension of day-to-day clinical practice. Thus, the concept of a clinician-imager was emphasized in our proposal. All of us will agree that getting to the correct diagnosis, in the safest and most expeditious manner, is an important goal in clinical medicine. The clinician's right to using only a stethoscope to the exclusion of say, complimentary use of the hand-held ultrasound (when the latter provides far superior information), is rather artificial and possibly sets us up for less-than-optimal patient care.

One of our master clinician-teachers used to often say, "In God we trust but everybody else must show proof." There is much evidence that imaging provides incremental value in the diagnosis and, in fact, a lot of clinical information not supported by imaging data is often reassessed in clinical practice. Therefore, it is likely to anchor the physical exam in the future; the remaining debate in imaging is about more complex issues like societal costs and whether testing changes outcome. However, test performance characteristics of traditional auscultation methods remain mostly untested or dismal when tested, especially in the current training environment (2,3). It is less likely to get better even with seniority (2). We should also appreciate that diseases, once defined only by obvious physical findings or classic symptoms, are now being detected and sometimes treated (e.g., patent foramen ovale in recurrent cryptogenic stroke) very early before such findings appear. Imaging is showing disease where little was suspected clinically (4). Finally, questions (like filling pressures, left ventricular function, viability, risk of sudden death, and so on) are being asked that are outside the ambit of traditional touch, smell, sound, or feel. One would suspect that even Leatham, Wood, and Harvey would approvingly allow easily available imaging techniques into their clinical armamentarium if they practiced today.

Of course, this assumes an optimally obtained imaging study. The issues of training requirements and test performance at the bedside would need to be standardized to reap the maximum benefits from powerful imaging modalities. Nevertheless, in our view, these issues are manageable and possibly inevitable given the push to quality in clinical medicine. Unless unexpected changes in economics play an adverse role in the development of miniaturized technology, imaging that makes "believing" more