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Molecular imaging: A Promising Future?

Interviewee:

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The European Society of Molecular and Functional Imaging in Radiology (ESMOFIR) was founded in 2010 to provide a scientific forum for molecular and functional imaging and to promote education, research and recommendations in these fields among the radiological community. It is a subspecialty society of the European Society of Radiology. HealthManagement Managing Editor, Claire Pillar, spoke to ESMOFIR's President, Prof. Nicolas Grenier about the future of molecular imaging.

What do you see as the most promising applications of molecular imaging?

I think there are two main applications. Actually, we are able to detect many pathologies, but not all of them, and most of our imaging techniques and most of our contrast agents are unspecific. So, one of the most promising applications of molecular imaging is to be able to specifically identify most of the diseases by using targeted agents and to obtain their main biological characteristics.

The other main application is in the field of therapy. There are many techniques, which are developing to be able to provide targeted therapy. Based on these new specific imaging techniques, it becomes much easier to target non-invasive therapy. This is why the development of specific diagnosis and non-invasive target therapy is very complimentary. That's what we call theragnostics, combining specific agents with a physical effect like a thermal, a mechanical or a magnetic activation. For example, nanovehicles sensitive to heat (eg. Thermosensitive liposomes) can be covered by fragments of antibody to reach chosen pathological cells and loaded with a therapeutic agent released once the temperature is increased externally. Microbubbles can also be targeted and loaded and disrupted by application of transcutaneous ultrasound..

How far away are we from widespread use?

I think we are quite far away. Targeting the lesions with specific agents is really on the way. However, the problem will be money, because in the market the real problem is not knowledge of how to develop a specific agent for specific diseases. It is whether it is profitable. For example, if the agent is dedicated to a specific type of breast tumour the market will be very small. We need to find a middle situation where we would be able to target a certain type of disease that has a quite large spectrum, probably larger than we would expect, but it would be a trade-off between specificity and the cost-benefit ratio.

Molecular breast imaging has shown some promising results. What place do you see for this technique?

What I would say, as a non-specialist in breast imaging, is that we need to better characterise breast tumours. Some of these tumours can be sensitive to specific therapies, others not, depending on the expression of the cells. Therefore, depending on the category of tumour, the prognosis and the sensitivity to treatment will not be the same. Identifying its different sub-types related to genomics using imaging phenotyping will improve probably management of these tumours, and then these could be combined with targeted therapies in patients.

The European Society for Molecular and Functional Imaging in Radiology's ESMOFIR slogan is "towards personalised medicine". Can you expand on that?

To my point of view, imaging has to contribute to this typing of the different types of genomes in oncology. Tumours are better and better characterised due to proteomics and genomics. To be able to make the link between imaging characteristics and genomics could allow us to participate in the phenotyping of the tumour in a given patient, non-invasively. By doing this type of imaging, which could be functional or molecular or both, we would be able to characterise an individual patient's tumour, and this will have an impact on prognosis and management. 'Radiomics' is a mix of genomics and radiology.

Imaging plays the core role in the management of every phase of the patient journey. The advantage of imaging is that it can give patient information in vivo and non-invasively, and it can follow that with time. For example, we know that tumours are changing even their genotype during evolution and different phases of treatment. So, if we could follow that with imaging in the future, I think imaging will keep a major role, a growing role in management.

What do you see as the challenges in bringing functional imaging into radiology?.

The challenges are to find quantitative, but also reproducible, biomarkers of organ functions or any type of tissue. The challenge for functional imaging is to have reproducible techniques and effective usable tools for post-processing. Functional imaging of the heart, kidney, liver, and tumours has to be optimised in terms of protocols and reproducibility. ESMOFIR's main role is to validate accurate biomarkers in this context. The tools have to be reinforced and then evaluated for effectiveness. This will take time.

ESMOFIR is holding a workshop on clinical functional imaging in July 2014. Please tell us more.

The workshop will include lectures on the importance of validating functional biomarkers and on the objectives of techniques in molecular and functional imaging. There will also be practical sessions on how to do repetitive acquisitions, how to do reproducible quantifications, and with which tools. We really need to emphasise the role of radiology in modern patient management.

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