

Image Registration Opens New Prostate Cancer Options
By [name withheld]

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Hollywood, with its special visual effects, has opened new worlds to moviegoers. Many of the same techniques that amaze audiences can be used in medical imaging to help patients. A breakthrough called **Image Registration** is opening new worlds in prostate cancer diagnosis and treatment.

Image Registration, also called co-registration or fusion, can be achieved using complex computer algorithms to achieve an amazing result. As one author puts it, "Generally, the goal is to warp one image to the coordinate system of a second, for example, to compare disease progression in images of the same patient over time..."¹ It can also be used to overlay and digitally marry two different imaging processes such as ultrasound and magnetic resonance imaging (MRI) for more complete visual information.

With regard to prostate tumors, an MRI scan of a prostate tumor can be merged with real-time ultrasound while a patient is in the examining room. This brings radiological imaging right into the urology office, offering much greater visual detection, diagnosis and treatment planning. Thus, I have technology with highly specialized software that "recognizes" both kinds of images. The software has an elastic ability to match, point for point, the MRI image with what I'm seeing on the ultrasound. This is called **deformable** or non-rigid registration, very similar to common cinematic effects. In my office, this software gives me control over precisely marrying the two images to create a virtual 3D representation of the gland that can be rotated in every direction. It reveals a suspicious area's location, shape and size from any angle:

MR/ Ultrasound Image Fusion and Targeted Biopsy

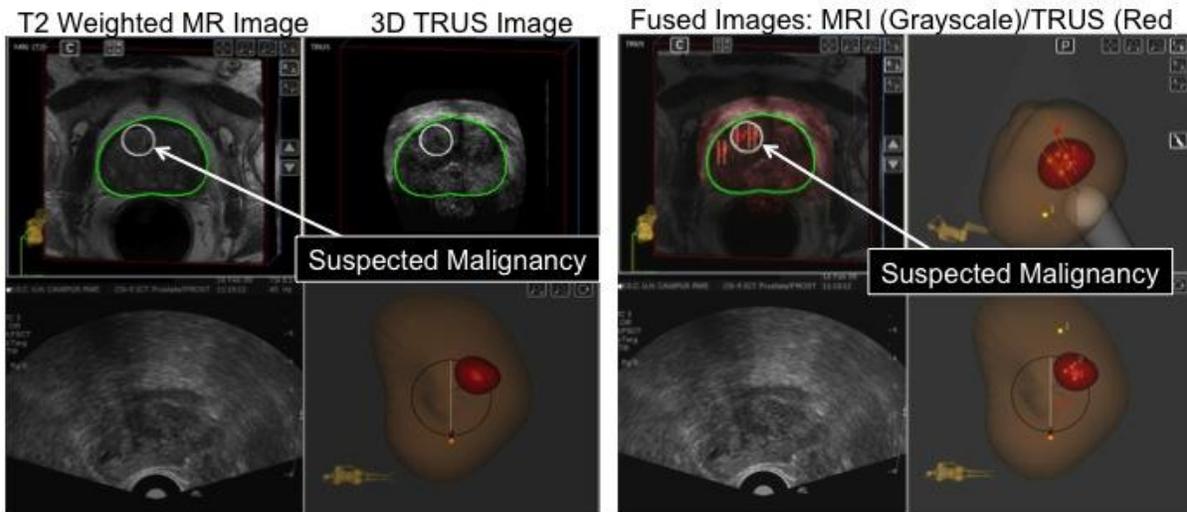


Image Registration is incredibly beneficial for patients. It makes it possible to perform a precise, targeted biopsy. As I've written previously, targeted biopsy is a quantum leap forward in diagnosis. It solves the problem of random, systematic TRUS biopsies that have a hit-or-miss quality because they are essentially "blind" to tissue differences within the gland. Not so with Image Registration, which brings MRI's high definition images into union with accurate, real-time ultrasound for needle guidance.

Another benefit is the use of Image Registration to guide focal prostate cancer treatment for qualified patients. A recent article published in the British Journal of Urology describes the experience of a physician team from University College of London in using Image Registration to guide focal HIFU ablation for 26 consecutive patients. They concluded, "Non-rigid MR-US registration is feasible, efficient and can locate lesions on US [ultrasound]. The process has potential for improved accuracy of focal treatments, and improved diagnostic sampling strategies for prostate cancer."ⁱⁱ

For more information on image fusion and its potential, see my video at <http://www.youtube.com/watch?v=gvOmUCUiBxo>

ⁱ Radke, Richard. Computer Vision For Visual Effects. New York: Cambridge University Press. 2013.

ⁱⁱ Dickinson L, Hu Y et al. Image-directed, tissue-preserving focal therapy of prostate cancer: a feasibility study of a novel deformable magnetic resonance-ultrasound (MR-US) registration system. BJU Int. 2013 May 9. doi: 10.1111/bju.12223. [Epub ahead of print <http://www.ncbi.nlm.nih.gov/pubmed/23819525>]