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Image guidance and Motion Adaptation in Radiation Therapy

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Modern radiation therapy can achieve a very high level of conformality, meaning that the size and shape of nearly any disease site (such as a tumor) can be irradiated to uniform dose while sparing surrounding normal tissue. However, an inherent limitation in many treatment planning and delivery systems is that the body region under treatment is considered to be static and unchanging. This assumption is false, as there are many processes over varying time scales that change the shape, location, and size of the treatment target and surrounding tissue. Technological advances are now making it feasible to treat tumors adaptively, so that the radiation delivered is modulated in real time to match the changes in the body. These advances will enable more accurate and precise radiation treatments, which should improve cure rates and patient survival times. In this talk, I will present methods for observing the dynamic tumor, determining its changes in shape, size, and position, and delivering adaptive therapy.