The role of micro CT in the imaging of surgical pathology specimens

The absence of real-time, detailed, 3D, information on the composition of surgical specimens presents an enormous challenge in surgical oncology and pathology. The problem is especially pressing for breast cancer where as many as nearly 1 in 3 patients undergoing lumpectomy have been found, upon pathological examination of the slides, to be margin positive. These patients need to return to the hospital for re-excision, sometimes multiple times, in order to achieve negative margins. A solution may be found in a relatively new technology, Micro CT, a high resolution X-ray imaging method that has been widely used in industry and materials science but little used in medicine. Over the past three years we have imaged a great variety of surgical specimens with three Micro CT machines (SkyScan 1173 Micro CT, Xradia MicroXCT-200 and Nikon Metrology XTH225). Our findings indicate the Micro CT is able to provide 3D images of surgical specimens which can identify within 10 minutes, most of those breast cancer patients later found to be margin positive on pathological analysis, as well as to identify a small number of patients whose cancers appear to be margin positive on Micro CT alone. Micro CT can also identify lymph nodes in cancer specimens including nodes not detected by pathological dissection. These findings suggest that Micro CT has a considerable potential for providing the surgeon and pathologist with rapid, accurate, actionable information on the status of the surgical specimen while the patient is still in the OR.

Biography

James Michaelson is the Director of the Laboratory of Quantitative Medicine, Member of the Departments of Pathology and Surgery at the Massachusetts General Hospital and Associate Professor in Harvard University. His research concerns: The assembly of very large databases on patients; the development of improved mathematical methods for predicting cancer outcome; the analysis of patient outcome and cost; the analysis of cancer screening; the mathematics of growth; the mathematics of metastasis; the use of modern computer speech and telephony to design systems that improve patient compliance and the development of advanced method for imaging cancer specimens.

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