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Rapid screening of cancer margins in tissue with multimodal confocal microscopy.

Gareau DS, Jeon H, Nehal KS, Rajadhyaksha M.; *J Surg Res.* 2012 Dec;178(2):533-8. doi: 10.1016/j.jss.2012.05.059.

ABSTRACT

BACKGROUND: Complete and accurate excision of cancer is guided by the examination of histopathology. However, preparation of histopathology is labor intensive and slow, leading to insufficient sampling of tissue and incomplete and/or inaccurate excision of margins. We demonstrate the potential utility of multimodal confocal mosaicing microscopy for rapid screening of cancer margins, directly in fresh surgical excisions, without the need for conventional embedding, sectioning, or processing.

MATERIALS AND METHODS: A multimodal confocal mosaicing microscope was developed to image basal cell carcinoma margins in surgical skin excisions, with the resolution that shows nuclear detail. Multimodal contrast is with fluorescence for imaging nuclei and reflectance for cellular cytoplasm and dermal collagen. Thirty-five excisions of basal cell carcinomas from Mohs surgery were imaged, and the mosaics analyzed by comparison with the corresponding frozen pathology. **RESULTS:** Confocal mosaics are produced in about 9 min, displaying tissue in fields of view of 12 mm with ×2 magnification. A digital staining algorithm transforms black and white contrast to purple and pink, which simulates the appearance of standard histopathology. Mosaicing enables rapid digital screening, which mimics the examination of histopathology.

CONCLUSIONS: Multimodal confocal mosaicing microscopy offers a technology platform to potentially enable real-time pathology at the bedside. The imaging may serve as an adjunct to conventional histopathology to expedite screening of margins and guide surgery toward more complete and accurate excision of cancer.