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14 Near-Infrared Confocal Laser Scanning Microscopy of Bladder Tissue In Vivo

Koenig F, González S, White WM, Lein M, Rajadhyaksha M.; Urology. Apr 1999: 53(4):853-7.

ABSTRACT

OBJECTIVES: To assess the potential of a near-infrared confocal laser scanning microscope (CLSM) for imaging bladder tissue in vivo.

METHODS: Confocal images of the exposed bladder of male Sprague-Dawley rats were obtained with a CLSM. To minimize tissue motion, the bladder was placed in light contact under an objective lens housing, and the top surface was lightly flattened with a coverslip. Images were obtained from the outer and inner layers of the bladder wall with a lateral resolution of 0.5 to 1 micron and an axial resolution (section thickness) of 3 to 5 micron. The confocal images were later correlated with routine histologic studies.

RESULTS: The CLSM allows imaging of the urothelium, the superficial and deep portions of the lamina propria, the muscularis propria, and the serosa of the bladder wall in vivo. Urothelial cells, collagen bundles and fibers, muscle, and circulating blood cells in capillaries and larger blood vessels are easily visualized. The confocal images correlated well with the histologic studies.

CONCLUSIONS: Confocal microscopy allows real-time, high-resolution, high-contrast imaging of cellular and structural morphologic features to a maximal depth of 300 micron within the bladder wall in vivo. Artifacts caused by tissue motion can be minimized with a bladder-objective lens contact housing.