High resolution microendoscope to improve early detection of bladder cancer

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Introduction

- Bladder cancer is the 6th most common cancer in the United States.1
- High rates of recurrence require frequent surveillance and make bladder cancer the most costly to treat.2
- Standard cystoscopy has difficulty distinguishing benign lesions from small, subtle, cancerous lesions, necessitating many biopsies.2
- New endoscopic techniques such as narrow-band imaging can improve sensitivity, but there is a need to improve specificity.3
- We are evaluating a high-resolution microendoscope (HRME) to help identify and characterize bladder lesions with high specificity during cystoscopy.
- The HRME is a low-cost (<$3000) fiber-optic microscope that provides images with subcellular resolution in real time, revealing detail traditionally only available following biopsy and histology.

Methods

- Patients scheduled to undergo standard of care cystoscopy were recruited for in vivo imaging at Lyndon B. Johnson Hospital in Houston, Texas.
- In addition, bladder specimens were obtained for ex vivo imaging to aid in the development of an automated diagnostic algorithm.

High-Resolution Microendoscope (HRME)

Results

- To date, 12 patients have been accrued and imaged in the operating room at LBH Hospital using the HRME system and 7 ex vivo bladder specimens have been imaged at Rice University.
- Types of lesions imaged to date include erythematous lesion/cluster, papillary lesion/cluster, tumor, scar, bulous edema, and post-stent inflammation
- Normal bladder tissue sites have been imaged for comparison.
- A preliminary analysis was performed to explore the microscopic appearance of bladder lesions and to develop methods to distinguish precancerous and cancerous lesions from non-neoplastic tissue.
- Initial results indicate that cell nuclei are larger, more crowded, and more erratically shaped at lesion sites than in normal bladder tissue.
- This is consistent with our previous clinical studies conducted in other organ sites, such as the esophagus, cervix and oral cavity.

Conclusion

- We will continue recruiting patients in order to develop an image analysis algorithm to classify lesions as benign or cancerous.
- Develop a second generation HRME system that incorporates real time image analysis and diagnosis based on the algorithm.

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References