Introduction

- Design prostate hyperplasia (BPH) affects a majority of men over the age of 60 in the United States.
- Along with BPH, lower urinary tract symptoms (LUTS) and bladder dimension changes are a common development in this population.
- The complex homeostasis of the male urethral system and their effects on BPH symptom development are still not fully understood.
- Non-invasive analysis and diagnostic methods for prostate and bladder pathologies have previously been limited.
- Magnetic resonance imaging (MRI) has the potential to analyze many of these factors in a single imaging session.
- MRI based computational fluid dynamics (CFD) models could provide valuable information about the urinary flow dynamics.

Purpose

To implement an MRI urodynamics protocol and to perform patient specific computational fluid dynamics (CFD) simulations of bladder voiding in healthy controls and BPH patients.

Materials and Methods

Patient Population

- 2 healthy controls and 3 BPH patients were recruited.
- MRI was performed on a clinical 3T scanner using a high-density flexible surface coil array.
- 3D Fat-saturated echo-planar (EPI) T2-weighted acquisitions were performed immediately before and after voiding.

Image Processing

- The bladder and urethra were segmented from pre and post voiding 3D images, while bladder cross-sectional area change during voiding was calculated from the 2D RTI using a semiautomatic segmentation software mimics.

Acknowledgements

This work was funded by the National Institutes of Health Grant, 4R21DK090022-04 (Dr. Roldán-Alzate).