Fiber Tract Mapping in Isolated Sections of Human Prostate at High Field

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Introduction

Last year we updated the first attempts to map the cavernous nerves that surround the human prostate. Detection of these nerves is essential in order to minimize nerve damage during prostate cancer surgery, since damage can lead to a loss of sexual function. The difficulty is that the nerves are so small and deep in the body, in an area that's hard to keep still, that mapping these fibers *in vivo* is impractical. Our goal is thus to detect these nerves on isolated prostate tissue, and then use the data to generate a map of fibers that may be used to guide surgery. To do this validation is required, which we reported feasible on small sections of the prostate. However the data require special attention for processing. Here we show fully processed 3D fiber tract maps clearly correlating with the nerve fiber tracts and muscle fibers.

Experimental

Diffusion-weighted imaging in 21 non-collinear directions used a spin echo pulse sequence and a resolution of 30x30x300 µm and a b-value of 1000 s/mm^2. The denoising of the original DTI data set had been implemented using the non-local means technique before the diffusion tensor was generated. Tensor processing of HARDM data sets was conducted using fanDTasia™ (1).

Results and Discussion

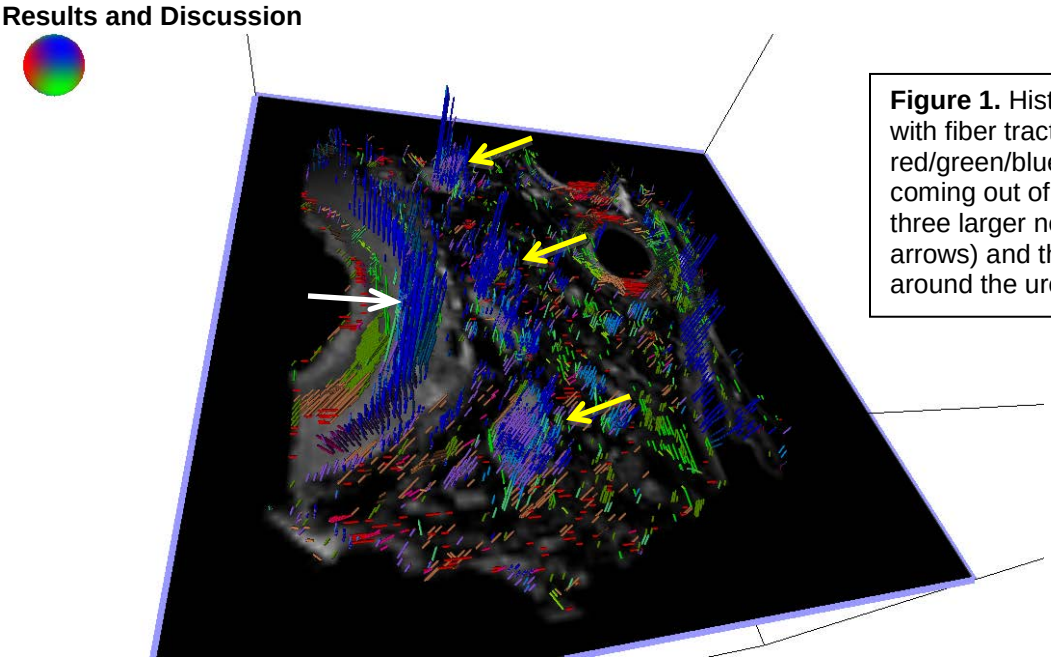

Figure 1. Histology (grayscale) with fiber tracts in conventional red/green/blue overlay, blue coming out of the page. Note the three larger nerve fibers (yellow arrows) and the muscle fibers around the urethra (white arrow).

Conclusions

On small samples complete 3D fiber tracts are histologically validation. The work is time consuming and expensive, so to obtain a larger n before publication substantial funding is required. Thus this work has been submitted as an NIH RO1 to be reviewed in February 2013.

Acknowledgements

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References

(1) A. Barmpoutis and B. C. Vemuri Conf Proc IEEE ISBI 1385-88 (2010).