3D-Printed Phantoms to Quantify Accuracy and Variability of Goniometric and Volumetric Assessment of Peyronie's Disease Deformities

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Introduction

- Traditional characterization of Peyronie's disease (PD) deformities involves manual goniometry and measurement of penile length
- These measurement techniques neglect volumetric assessment and evaluation of complex deformities
- Inter-provider variability in traditional measurement techniques complicates accuracy

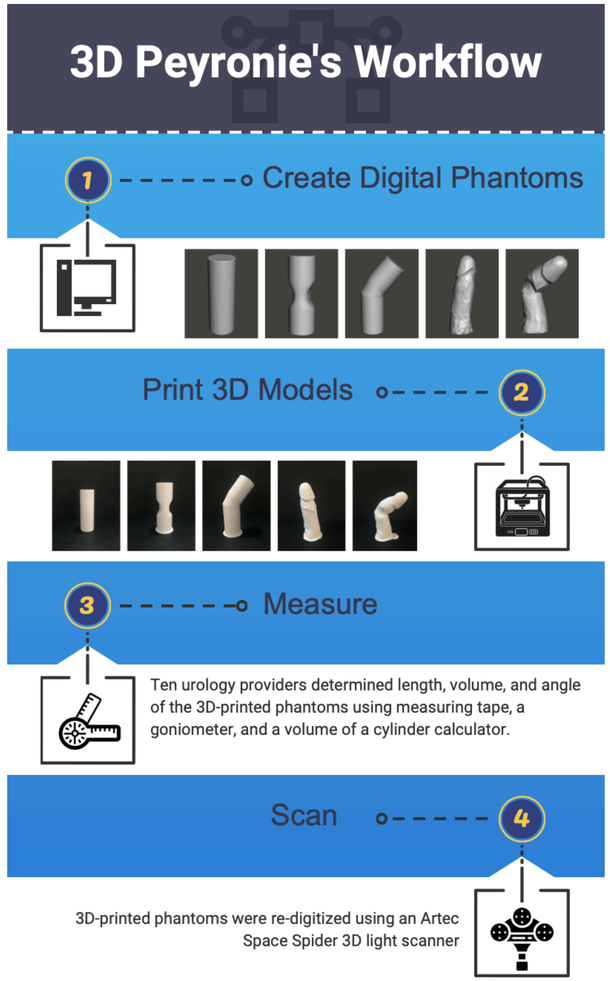
Aim

To evaluate accuracy and variability in measurement using 3D-printed models and establish a workflow for computational assessment including volumetrics.

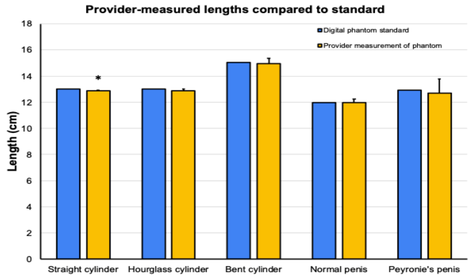
Study Design and Methods

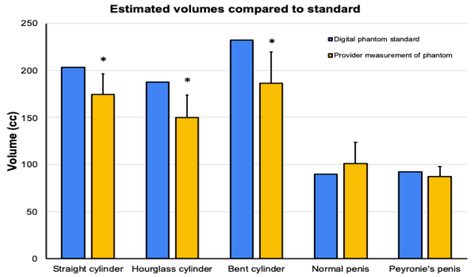
- Digital phantoms were created using the 3D software Meshmixer, and analysed using Autodesk Fusion 360
- Digital phantoms were 3D-printed using a Makerbot Replicator 3D printer with the material polylactic acid
- N=10, ranging from trained medical students to urology attendings
- 3D models were re-digitized using an Artec Space Spider 3D light scanner

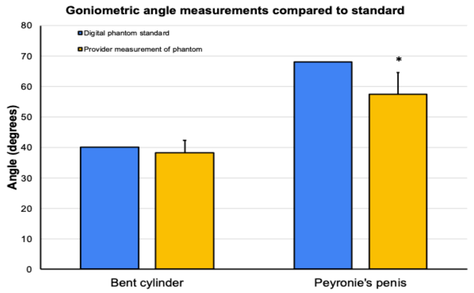
Methods



Results







Discussion

- Our results suggest urology providers' measurements suffer from inaccuracy and variability, particularly in volume estimation and PD goniometry
- A computational workflow may be useful for the clinical and research armamentarium when greater accuracy or volume assessment is needed

Future Directions

- Re-digitize 3D printed phantoms using a 3D light scanner, and compare measurements to original standard
- Translate computational workflow to human patients in an IRB-approved clinical trial

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