557: Use of Ultrasound Urodynamics to Identify a Potential Shape-Mediated Sub-Type of OAB

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Table 1. Participant Information

	Control	OAB	P value
Age (years)	30.69 ±13.00	52.06 ±11.39	<0.001
BMI (kg/m^2)	27.27 ± 4.94	34.83 ±10.00	0.028
Sex	54%F, 46%M	100%F, 0%M	<0.001
Bladder Capacity (mL)	614.04 ± 144.54	418.04 ± 311.71	0.012

BMI = Body Mass Index. F = Female, M = Male.

Figure 1: 3D ultrasound image of a full bladder showing the transverse (top left), sagittal (top right) and coronal (bottom left) planes, as well as a rendered volume of the bladder (bottom right). The width (W), depth (D), and height (H) measurements are indicated in yellow.

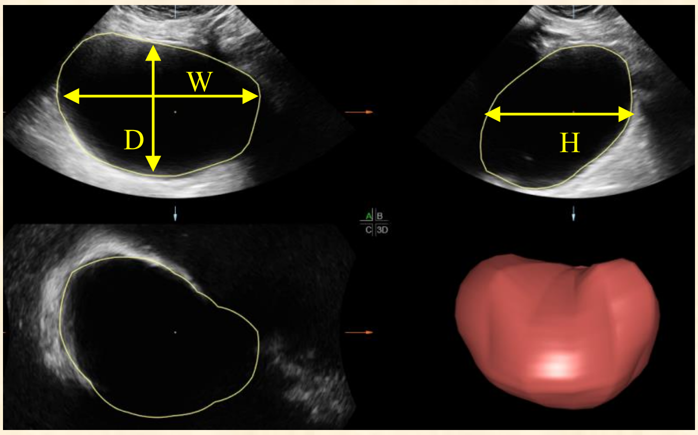


Figure 2: Average bladder diameter strain for the Control group (blue stars) and OAB group (orange triangles) in the depth (top left), width (top right), and height (bottom left) directions as a function of %capacity (normalized volume). Stars indicate a significant difference between Controls and OABs with p<0.05.

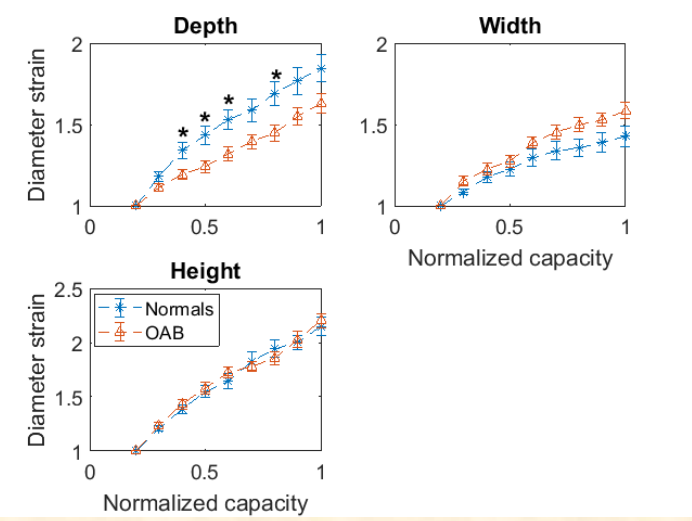
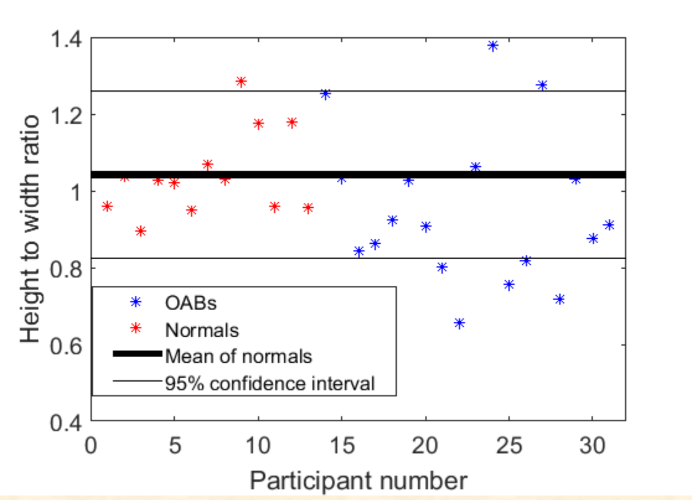


Figure 3. Ratio of height to width diameters from Controls (red) and OABs (blue). Thick black line indicates the average for the Control group while thin black lines are reflective of the 95% confidence interval used to identify outliers for height-to-width ratios.



Study Aims and Hypothesis

This study's objective was to characterize changes in bladder geometry throughout filling, and to compare any patterns of geometry changes in filling between OAB patients and volunteers with normal bladder function. The hypothesis was that ultrasound urodynamics could be used to identify a subset of OAB patients with bladder shapes significantly different than those of normal volunteers.

METHODS

This prospective study included 24 participants consisting of 5 men and 5 women without OAB and 14 women with OAB. All participants underwent ultrasound urodynamic testing with concurrent 3D ultrasound images acquired once every minute during bladder filling at an infusion rate of 10% cystometric capacity per minute. Ultrasound was performed using a GE Voluson E8 system with a 4-8 MHz transabdominal probe. Bladder diameters in the depth, height, and width directions were measured using 4D View software by GE (Fig. 1) at every 10% increase in capacity. Diameter strain (length normalized by length at 20% bladder capacity) was plotted as a function of normalized capacity (bladder volume divided by the voided volume) (Fig. 2). The height to width ratio at the end of filling (100% capacity) of the normal participants was used to determine if any bladders were outliers by defining a 95% confidence interval (Fig. 3).

RESULTS

Participant characteristics are shown in Table 1. Mean bladder diameter strain increased in the depth, width, and height directions in both groups over the course of filling (Fig. 2). There were significant differences between normals and OABs in the depth direction at capacities at capacities of 40%, 50%, 60%, and 80% (Fig. 2 asterisks). However, there were no significant differences in strain in the width or height direction. The greatest degree of change in diameter was seen in the height direction which grew by about two fold (100% strain) in both the normals and the OABs. The mean and standard deviation of the height-to-width ratio of the normals was 1.06 ± 0.12 yielding a 95% confidence interval of 0.82 to 1.23 (Fig. 3). One normal participant had a height-to-width ratio above this interval, as did two OAB participants indicating a long, eggplant shaped bladder. Additionally, five OAB participants had height-to-width ratios below this interval indicating short, pancake shaped bladders. These seven participants are identified as possibly having shape mediated OAB.

CONCLUSIONS

This study shows that non-invasive ultrasound can potentially be used to identify differences in bladder shape and dimensions between individuals with OAB and without OAB. This method was used to identify a subset of OAB patients with abnormal HWR at the end of filling who may benefit from treatment targeted towards bladder shape such as weight loss, bowel care, and changes in posture.