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IS OVERACTIVE BLADDER MICROVASCULATURE DISEASE A COMPONENT OF SYSTEMIC ATHEROSCLEROSIS?

Hypothesis / aims of study

It has been claimed that atherosclerosis and vascular dysfunction might be important factors as possible mechanisms of OAB and bladder dysfunction (1). We aimed to evaluate the relationship between Overactive bladder (OAB) and systemic atherosclerosis in a cohort of women.

Study design, materials and methods

Women aged >18 with OAB (cases), and women without OAB (controls) were eligible for recruitment (2). Women with OAB were recruited from the urogynecology unit and they were classified as OAB-wet or OAB-dry, based on a voiding diary record of having urgency urinary incontinence or not, respectively. Control subjects were recruited from the gynecology outpatient clinic that had an Overactive Bladder Awareness Tool (OAB-V8) score of <8 and had no urgency or urinary tract infection. In this case control study, we assessed atherosclerosis indicators such as Framingham Risk scores, carotid and femoral artery intima media thicknesses (CIMT and FIMT) and evaluated possible bladder wall responses to atherosclerosis using endovaginal color Doppler ultrasound and urinary cytokines such as Nerve growth factor (NGF), monocyte chemoattractant protein-1 (MCP-1) in women with OAB and controls. CIMT and FIMT measurements were performed using a 9L4 linear high frequency probe in both sides of the neck and the inguinal regions (Acuson S 1000 diagnostic ultrasound device, Siemens Medical Solutions, USA). Endovaginal ultrasound was performed on all participants with the use of a biplane, high frequency (12 MHz) transducer (type 8848, B-K Medical, Herlev, Denmark). To provide quantitative assessment of blood perfusion of bladder neck, commercially available PixelFlux software (Chameleon Software, Germany: www.chameleon-software.de) was used. Each parameter was calculated including data from all imaged vessels in Color Doppler mode coded as red and blue reflecting the direction and velocity of the blood particles movement. Results represent the sum of "red" and "blue" values named as the "mix" value for each parameter (Vmix, Imix, Amix, Plmix, and Rlmix.). These parameters were explained previously (3). Figure 1 shows carotid and femoral arteries intima media thickness measurements and evaluation of bladder neck vascular perfusion with endovaginal ultrasound. In analysis, independent samples t-test was used to evaluate the relationship between OAB and atherosclerotic findings when parametric conditions were met and Mann Whitney U test when parametric conditions were not met. Since OAB-V8 is a Likert style index, Kendall's Tau was used to assess the correlation between the severity of OAB and atherosclerotic variables. P < 0.05 was considered significant.

Results

In the final cohort, 147 women were included. Of these, 73 were controls, and 74 were overactive bladder (OAB) cases (wet type n=45; dry type n=29). Mean age of the OAB cases was significantly higher than of the controls (55.78 ± 13.12 vs. 44.07 ± 14.43, p < 0.001). Compared to controls OAB cases had significantly more gravidity (3.60 ± 2.02 vs. 2.11 ± 2.00, p < 0.001), and parity (2.45 ± 1.53 vs. 1.42 ± 1.41, p < 0.001). Among participants, most of them never smoked (n=129, 88.4%) and among the smokers, there were significant differences between the groups when means of package year was evaluated (p = 0.844). One fourth of participants stated that they have hypertension, whereas 23% were receiving anti-hypertensive therapy. Characteristics associated with OAB included pre-existing hypertension (HT) (p < 0.001), higher means of fasting blood glucose (FBG) (p = 0.03), higher total cholesterol (TC) (p = 0.04); higher systolic (p = 0.01) and diastolic blood pressure (BP) (p = 0.004), and higher BMI (p < 0.001). On further analysis, when compared to control group, wet type OAB patients had higher means of FBG (p = 0.03), diastolic BP (p = 0.009), and BMI (p < 0.001), while dry type OAB patients had higher means of FBG (p = 0.03), LDL-C (p = 0.01), TC (p = 0.01) and both systolic (p = 0.004), and diastolic BP (p = 0.04). Indicators of atherosclerosis such as Framingham scores, CIMT and FIMT, the level of urinary biomarkers such as NGF and MCP-1, and the calculated color pixel ratio in region of interest of bladder neck were evaluated. OAB cases had significantly higher means of 10-year CVD and CHD risks (both p < 0.05), and higher right and left carotids intima media thickness (p < 0.05), and femoral artery thickness (p < 0.05). Compared to controls wet type OAB patients had higher means of 10-year CVD, and CHD risks (both p < 0.05), and higher right and left carotid intima thickness (p < 0.05) and femoral artery thickness (p < 0.05). However, 10-year CVD risk was the only variable associated with dry type OAB when compared controls (p < 0.001). Mean MCP concentration was significantly higher in the control group compared to OAB cases (p < 0.001) and wet type OAB patients (p < 0.001) but not significantly different after adjusting for urine creatinine. Cytokine concentrations were not significantly different between the groups after urinary creatinine adjustments. In contrast, mean NGF concentrations in dry type OAB patients were higher than the control group (p = 0.001) but similar after adjusting with urine creatinine. Women with OAB have decreased bladder neck perfusion as found by color Doppler ultrasound. In women with OAB, calculated color pixel ratio in the ROI measured by the software system was found to be significantly lower in sagittal section of bladder neck. When correlation analysis was performed between OABV8 scores, and Framingham scores, and bladder vascular indexes, there was a significant positive correlation between developing atherosclerosis risk. There was a significant negative correlation between the severity of OAB and the calculated color pixel ratios.

Interpretation of results

An impaired vascular circulation result from systemic atherosclerosis might be associated with overactive bladder and its severity.

Concluding message

In conclusion, OAB is known as creating significant impact on the health-related quality of life and a considerable economic burden. However these findings show that OAB might be the microvasculature disease a component of the systemic atherosclerosis, which is life threatening comorbidity.

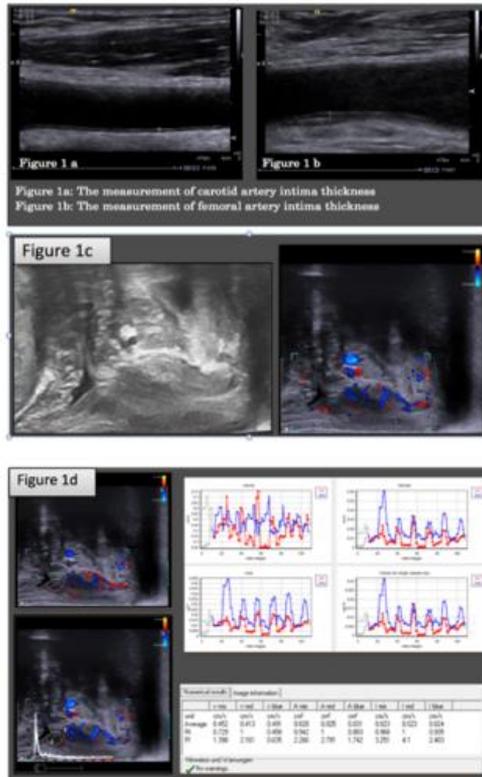


Figure 1: Carotid (Figure 1a) and femoral artery (Figure 1b) intima-media thickness measurements. Evaluation of bladder neck vascular perfusion with endovaginal ultrasound. Sagittal views of bladder and urethra with a biplane high frequency endovaginal transducer, in regular and color mode (type 8838 and 8848, B-K Medical) (Figure 1c). Analysis of the vascular parameters with the use of Pixel Flux software in the longitudinal plane. ROI is defined at the bladder neck (Figure 1d).

References

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