

## SITTING TIME, PHYSICAL ACTIVITY AND THE RISK OF LOWER URINARY TRACT SYMPTOMS: A COHORT STUDY

### Hypothesis / aims of study

Lower urinary tract symptoms (LUTS) are highly prevalent in middle-aged and elderly men and are negatively associated with their quality of life (QOL), contributing to significant public health burden. Despite extensive research efforts, the etiology and mechanism of LUTS has not been fully elucidated. Prolonged sitting time can produce changes of musculoskeletal and vascular milieu in the pelvis and lower extremity and these changes may cause LUTS. We hypothesized that prolonged sitting time would affect adversely LUTS. No studies have investigated the association between sitting time and the incidence of LUTS independent of physical activity. We, therefore, evaluated the association of sitting time and physical activity level with the development of LUTS in a large cohort of men free of LUTS at baseline who participated in a health screening examination program.

### Study design, materials and methods

Data on demographic characteristics, education level, medical history, medication, smoking status and alcohol consumption, were also collected by self-administered, standardized questionnaires.

The study population consisted of the subset of male Kangbuk Samsung Health Study participants who completed a physical activity questionnaire and underwent a comprehensive health examination from March, 2011 to December, 2014, and who had at least one follow-up visit prior to December, 2015 (n = 107,099). We excluded participants who had any of the following conditions at baseline: missing data for IPSS, the serum prostate-specific antigen (PSA) level  $\geq 3$  ng/dL, pyuria, hematuria, history of malignancy, history of cardiovascular disease, liver cirrhosis on ultrasound, history of kidney, bladder disease, renal failure or benign prostate hyperplasia, use of antipsychotic or antidepressant medication, use of medication for benign prostate hyperplasia, or use of medication for alopecia. Finally, we excluded participants with IPSS  $\geq 8$  at baseline. As some individuals met more than one criterion for exclusion, the total number of subjects included in the study was 69,795.

Physical activity level and sitting time were assessed using the validated Korean version of the international Physical Activity Questionnaire Short Form. Physical activity levels were classified into three categories: inactive, minimally active, and health-enhancing physically active (HEPA), as previously described. sitting time was categorized into the following groups using cut-points commonly used in previous studies: <5, 5-9, and  $\geq 10$  hours/day.

Usual dietary consumption was assessed using a 106-item self-administered FFQ designed and validated for use in Korea. BMI and blood pressure was measured. Serum levels of fasting blood glucose, haemoglobin A1c, insulin, total cholesterol, HDL-C, LDL-C, triglycerides, total PSA are recorded.

LUTS was assessed using the International Prostate Symptom Score (IPSS) and clinically significant LUTS was defined when IPSS score was 8 or higher. Cox proportional-hazards models were used to estimate the adjusted hazard ratios with 95% confidence intervals (CIs) for incident LUTS. Insulin resistance was assessed with the homeostatic model assessment – insulin resistance (HOMA-IR). Hypertension and diabetes was assessed.

### Results

Of the 175,810.4 person-years, 9,217 developed significant LUTS (incidence rate, 39.0 per 1000 person-years). In a multivariable-adjusted model, both decreased physical activity level and prolonged sitting time were independently associated with the incidence of LUTS. The hazard ratios (95% CIs) for incident LUTS comparing minimally active and health-enhancing physically active (HEPA) groups to the inactive group were 0.94 (0.89-0.99) and 0.93 (0.87-0.99), respectively (P for trend <0.001). The hazard ratios (95% CIs) for LUTS comparing 5-9 and  $\geq 10$  h/day sitting time to <5 h/day were 1.08 (1.00-1.24) and 1.15 (1.06-1.24), respectively (P for trend <0.001).

### Interpretation of results

Prolonged sitting time and decreased physical activity were positively associated with the development of LUTS in a large sample of middle-aged Korean men. This result supports the importance of both reducing sitting time and promoting physical activity for preventing LUTS.

### Concluding message

We look at the impact on voiding symptoms of sitting time length and physical activity level. We conclude that prolonged sitting time and decreased physical activity may deteriorate voiding symptoms.

Table 1. Hazard ratios<sup>a</sup> (95% CI) of LUTS (>8) by physical activity levels and sitting time

	Person-years	Incident case	Incidence Density (per 1000 person-years)	Age-adjusted HR <sup>a</sup> (95% CI)	Multivariate-adjusted HR <sup>a</sup> (95% CI)	
					Model 1	Model 2
<b>Physical activity level</b>						
Inactive	72,251.5	3,903	40.0	1.00 (reference)	1.00 (reference)	1.00 (reference)
Minimally active	74,207.1	3,722	37.5	0.95 (0.90-1.00)	0.94 (0.89-0.99)	0.94 (0.89-0.99)
HEPA	29,351.9	1,592	40.4	0.93 (0.87-0.99)	0.93 (0.87-0.99)	0.93 (0.87-0.99)
<b>P for trend</b>				0.014	0.011	0.012
<b>Sitting time</b>						
<5 hours/day	23,666.1	1,350	40.9	1.00 (reference)	1.00 (reference)	1.00 (reference)
5-9 hours/day	70,636.6	3,743	39.6	1.07 (0.99-1.15)	1.08 (1.00-1.16)	1.08 (1.00-1.16)
≥10 hours/day	81,507.8	4,124	37.9	1.16 (1.08-1.25)	1.15 (1.06-1.24)	1.15 (1.06-1.24)
<b>P for trend</b>				<0.001	<0.001	<0.001

<sup>a</sup> Estimated from Cox proportional hazard model.

Multivariable model 1 included physical activity and sitting time simultaneously as well as age, center, year of screening exam, smoking status, alcohol intake, educational level, total calorie intake, history of diabetes and history of hypertension; model 2: model 1 plus adjustment for BMI

#### Disclosures

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