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Comparative assessment of urination parameters in males in different body positions

Kulchavenya E.V.[1, 2], Naymark A.I.[3], Plugin P.S.[2], Maksimova S.S.[3], Shevchenko S.Yu.[1, 2]*, Yarin G.Yu.[4, 5], Alekseeva A.V.[5], Fedorenko V.N.[5]

[1]*Novosibirsk Research Institute of Tuberculosis*
[2]*Novosibirsk State Medical University*
[3]*Altay State Medical University (Barnaul)*
[4]*Novosibirsk Traumatology and Orthopedics Research Institute*
[5]*Innovative Medical-technological Center "NRITO Clinic" (Novosibirsk)*

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ABSTRACT

We performed open multicentral randomized cohort study in 72 males. Maximum urine flow rate Qmax, average urine flow rate Qave, and also time of urination were defined in all the patients. Qmax in standing position in males was on average 18.1 ± 6.2 ml/s (from 6 to 53 ml/s); Qave — 10.2 ± 2.7 ml/s (the range was from 2.7 to 29.6 ml/s). Urination time in standing position varied from 11 to 120 s (on average 30.5 s). Qmax in sitting position was 17.3 ± 3.5 ml/s (5.4–48.0 ml/s), and Qave was 10.6 ± 2.9 ml/s (2.7–30.5 ml/s). Urination time in sitting position varied from 10 to 109 s (on average 28.7 s). Qmax in sitting position increased by ≥ 1 ml/s in 34.7% of males, Qave increased in 40.3%. Urination quality depends on the number of causes that is why uroflowmetry indices are unstable. Taking into account that maximal and average speed of urine flow in every third male is higher in sitting position we recommend to carry out uroflowmetry in different positions for grounded references on urinary bladder voiding for a specific patient.

Introduction

Steady stable urine flow of laminar type, and complete urinary bladder voiding are the prophylaxis of many urological diseases [1–2]. So turbulent urine flow contributes to its reflux into excretory ducts of prostate gland that causes chronic prostatitis and prostate glandlithogenesis; constant presence of residual urine provokes the development of pathogenic microflora and besides the formation of concretions [3–4]. To evaluate the parameters of urination (maximal and average urine flow speed, urination time, the volume of released urine) is possible by means of uroflowmetry (UFM) that is the simplest noninvasive procedure. Uroflowmetric studies are widely applied in urology for diagnostics of very different diseases [4–6].

Traditionally a male urinates in standing position, but a female urinates in squatting position or sitting on a lavatory pan. We could not find the reasoning of such positions in literature. Recently the plates advising males to urinate in sitting position have appearedmore often in Europe and Asia in public toilets. Some people believe that this instruction is dictated by sanitary reasons

*Corresponding author. Novosibirsk State Medical University, 52, Krasny Prospect, Novosibirsk, 630091, Russia.
E-mail address: shevchenko_s@list.ru

to prevent urine splashing that is nearly inevitable, other consider the functional base that urination in sitting position is more physiological.

Aim of the Research

Comparing the main UFM parameters in different body positions.

Materials and Methods

Open multicentral randomized cohort study was carried out. 72 males were included into the study. Maximum urine flow rate Qmax, average urine flow rate Qave, and also time of urination t were defined by the method of uroflowmetry in all the males.

Statistical treatment of the results was carried out on personal computer by the means of statistical software Microsoft Exce1 2007 and Statistica for Windows 6.0. Arithmetic mean (x), arithmetic mean deviation (x – x) were defined; then standard deviation (σ) and mean error of relative value (m) were calculated further. To solve the problem of random differences of the obtained mean (relative) values we calculated the mean error of the difference between the two mean values. Obtained results were presented as mean value ± mean error (M ± m). Further by means of comparing of two stratified samplings average values (M_1 и M_2) Student's t-test was calculated and p significance value was defined. Differences at $p < 0.05$ were considered to be statistically significant.

Results and Discussion

4 of 72 examined males were in the habit of urination sitting on the lavatory pan except public lavatories. Other 68 males urinated in sitting position only when defecating.

Maximal urine speed flow in males on urination was 18.1 ± 6.2 ml/s (6–53 ml/s) on average; average speed was 10.2 ± 2.7 ml/s (the range was 2.7–29.6 ml/s). On urination in sitting position the reliable significant differences were not found in males; under the tendency for lower rate of maximal urine speed flow and higher rate of Qave: Qmax on urination in sitting position on average was 17.3 ± 3.5 ml/s (5.4–48.0 ml/s), average urine speed flow was 10.6 ± 2.9 ml/s (2.7–30.5 ml/s). Urination time ranged from 11 to 120 s (on average 30.5 s), in sitting position it was from 10 to 109 s (on average 28.7 s), that is there was no significant difference in mean indicators with changing body position. However we noted the tendency to faster urinary bladder voidingin sitting position.

Since UFM data in cohort proved to be rather heterogeneous we to select the subject groups in which the flow speed changed in different ways according to the position to be necessary. Urine flow speed instability as ≥ 1 ml/s considered to be significant. On urination in sitting position Qmax in sitting position in 25 males (34.7%) proved to be higher than on urination in standing position. In nine males (12.5%) the maximal speed of urine flow did not change with body position changes. A half of the subject patients (38 patients — 52.8%) had Qmax being higher on urination in standing position.

Average speed of urine flow in sitting position proved to be higher than in standing position in 29 males (40.3%); decreased in 31 males (43.0%) and was the same in 12 males (16.7%). Dynamics of basic UFM parameters is presented in the Figures 1 and 2.

The study carried out in 50 healthy volunteers at the age of 29.08 ± 3.8 years showed that maximal uroflowmetric indices could be obtained only in the strong urge; at incomplete filling of urinary bladder the urine flow speed proved to be reliably lower. UFM was carried out on the first, second and third urge, when a person had intolerable desire to urinate. On average Qmax was 17.4 ± 4.8; 24.1 ± 6.0 and 29.6 ± 6.5 ml/s accordingly. Qave was 9.9 ± 2.1; 12.9 ± 2.9 and 15.9 ± 4.0 ml/s out on the first, second and third urges; differences are statistically reliable [7].

M. Kaynar et al. demonstrated that the urine flow speed reliably increased in patients listening to the sound of babbling water [8]. We compared UFM in 44 patients with urination disorder due to the benign hyperplasia of prostatic gland and in 44 healthy volunteers on urination in sitting position and standing positions. In patients with benign hyperplasia of prostate gland (BHPG) Qmax on average on urination in standing was 10.2 ± 0.49 ml/s, on urination in sitting position it was 9.5 ± 0.55 ml/s. Qave was 4.7 ± 0.25 and 4.7 ± 0.31 ml/s accordingly. In healthy males Qmax on average on urination upright was 24.8 ± 0.78 ml/s, in sitting position it was 25.3 ± 0.78 ml/s, average Qave was 13.2 ± 0.36 and 13.5 ± 0.33 ml/s accordingly. We did not find any statistically significant differences in UFM indices [9].

In another study the average Qmax in males in standing position was 15.3 ± 6.7 ml/s and in sitting position it was 15.0 ± 7.0 ml/s. Qave on average in standing position was 8.6 ± 4.0 ml/s and in sitting position it was 8.25 ± 3.8 ml/s [10]. Analyzing present-day literature we have come to a conclusion that according to the total data of representative studies in males with the symptoms of lower urinary tract in sitting position Qmax increases (without statistical reliability) but in healthy males it does not change both on urination in sitting position and in standing one [11].

Opposite other researchers proved young males (mean age is 26.6) to have much worse UFM indices on

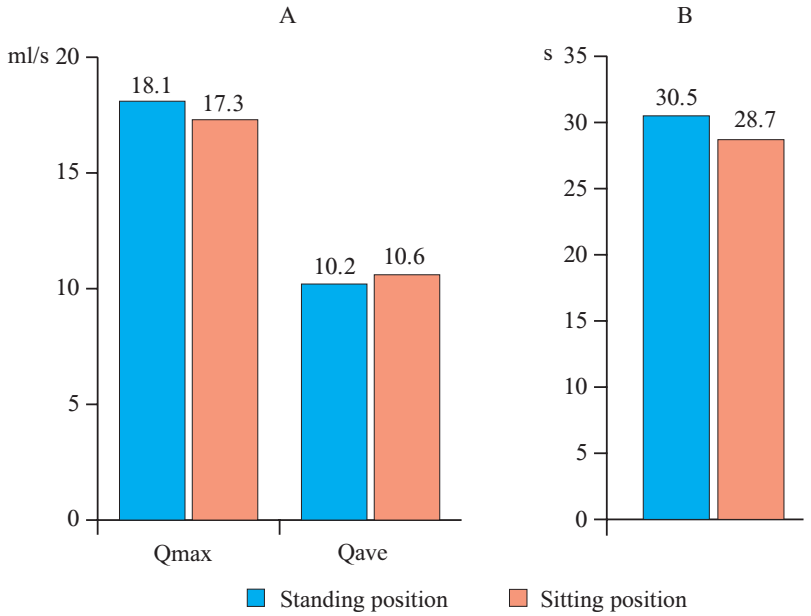

Figure 1. Basic parameters UFM in males in body position changing ($p > 0.05$):
A — maximal and average urination speed; B — urination time

urination in sitting position: Qmax is 19.8 ± 7.4 ml/s contrary to 23.8 ± 7.7 ml/s in standing position; Qave is 11.2 ± 4.5 ml/s contrary to 13.9 ± 4.5 ml/s in standing position [12].

C.A. Tam et al. estimated uroflowmetric indices, namely maximal and average urine flow speed, volume of released urine, and additional index calculated as the difference between maximal and average urine flow speed (Qmax – Qave). Qmax proved to be higher in young healthy males, but under developing recurrence of urethralstricture the index Qmax – Qave is more sensitive as for recurrence prognosis [13].

M.S. El-Bahnasawy and F.A. Fadl have not found any differences in maximal and average urine flow speed in all the cohort of the patients (200 males), but the volume of residual urine was reliably greater on urination in standing position. In young males Qmax was reliably higher in sitting position (16.6 ± 8.94 ml/s; standing position — 15.2 ± 7.5 ml/s). In patients elder than 50 the significant differences in UFM indices were not found but the volume of residual urine was significantly smaller when urinating in sitting position. We recommend to register UFM indices in the position being common for patient's urination [14].

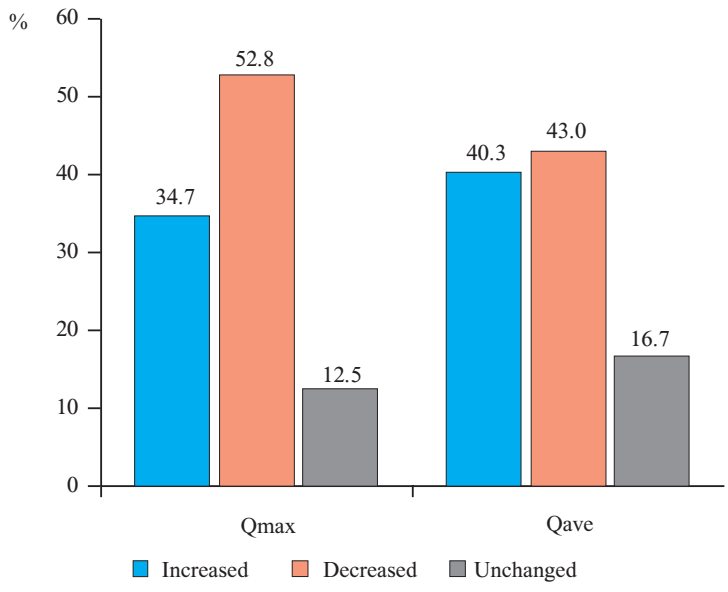

Figure 2. Basic UFM parameters dynamics in males in body position changing ($p > 0.05$)

Even healthy males practically did not have identical UFM indices during a day, a week and a month while the differences reached statistically significant rate. Even more UFM indices differed in bed-patients, urine flow speed was twice lower than on urination in standing position [15].

Since in Iran it is a rule to void the urinary bladder in bending position (squaring) the comparison of UFM indices in healthy persons and persons with symptomatic BHPG was carried out in three positions: in sitting position, upright position and in bending one. The authors have not found statistically significant differences in healthy males, however in BHPG the volume of residual urine on urination in standing position was twice lower than in other positions. The urination speed also was a little higher in standing position ($p = 0.011$) [16].

10 boys and 19 girls with hyperactive urinary bladder were studied. Boys urinated in standing position and in squatting one, girls urinated in squatting position. In girls Qmax in sitting position was higher than in squatting position, and in any position was higher than in boys [17].

In females urination parameters were compared in sitting position on the lavatory pan and in squatting position. Qmax in sitting position was on average 18.4 ± 3.2 ml/s, but in squatting position was 24.8 ± 4.9 ml/s, Qave was 9.2 ± 1.9 и 12.3 ± 3.3 ml/s accordingly. Urinary bladder voiding was better on urination in squatting position: the rest of residual urine was only 21.6 ± 12.7 ml, while on urination sitting on the lavatory pan it was 51.8 ± 22.2 ml [18].

In 30 healthy females aged of 22–37 (on average 28 ± 4) the UFM indices were compared in standing position, in sitting position, and in bending one; measuring to be more accurate was done as many as five times. The lowest urine flow speed was in standing position, however it did not influence the volume of residual urine [19].

45 students urinated in three positions: in sitting position, in squatting position, and in crouching position (crouching above the lavatory pan). Statistically significant differences were not found; the exception was the starting time of urination that proved to be longer in "crouching position". Regular bell-shaped curve of urine flow was obtained in a half of cases in sitting position, but only in 22.2% — in squatting position, and in 17.8% — in "crouching position". The most of females (88.9 %) avoid urinating in sitting position in public lavatories [20].

Conclusion

The urination parameters in males of the studied cohort did not alter reliably when body position being changed. However we obtained reliable differences in the number of patients with the UFM parameter improvement depending on the position. The quality of urination depends on many causes, that is why UFM indices are unstable; repeated measuring of position being common for the patient and on precipitant urination are necessary. Literature data about the advantage of this or that body position on urination are contradictory. Taking into consideration that maximal and average urine flow speed is higher in sitting position in every third male, we advice to apply UFM in different position to form grounded recommendations on urinary bladder voiding for each specific patient.

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