

## Award for Innovative Research Presented on Nocturnal Voiding Problems

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### **CAN SALT INTAKE RESTRICTION BE ONE OF THE TREATMENT OPTIONS FOR NOCTURIA?**

#### Hypothesis / aims of study

According to several reports, high salt intake causes excessive water consumption and edema, which may lead to lower urinary tract symptoms (LUTS), such as polyuria or nocturia. [1] Furthermore, chronic excessive salt intake is considered as one of the risk factors of lifestyle-related diseases, such as hypertension and renal dysfunction. These lifestyle-related diseases are also causative diseases of LUTS, such as nocturia. However, there is no prospective study on the influence and effect of dietary salt intake restriction on LUTS.

This study aims to determine the effects of restricted salt intake on patients with LUTS associated with excessive salt intake, especially nocturia.

#### Study design, materials and methods

The subjects were patients who woke up at least one time during the night and were diagnosed with excessive salt intake (8 g/day or more for men; 7 g/day for women).

For restricted salt intake, the subjects were instructed using a brochure via interview once every four weeks. Urination conditions (e.g. voided volume and urinary frequency) at the initiation of restricted salt intake and at 12 weeks after the initiation were prospectively evaluated using a frequency volume chart. In addition, changes of urinary symptoms before the initiation of the study and at 12 weeks after initiation were compared using the core lower urinary tract symptom score (CLSS). Patients who had organic abnormalities as potential causes of dysuria, such as neurogenic bladder, were excluded from the study. During the study period, switch of therapeutic drug for dysuria was never conducted. For estimated salt intake, urine sodium and creatinine were measured using spot urine samples with a conversion formula with adjustment for height, weight, and age. Statistical significance was established at  $P < 0.05$ .

#### Results

A total of 321 subjects (including 102 men) were analyzed and the mean age was  $64.3 \pm 13.6$  years. Of these subjects, 223 patients (69.5%) achieved salt intake restriction during the observation period (success [S] group) while 98 patients (30.5%) did not (failure [F] group). In the S group, the mean estimated salt intake decreased from  $10.7 \pm 2.3$  g to  $8.0 \pm 2.1$  g ( $P < 0.001$ ); the number of nocturia was improved from  $2.3 \pm 0.9$  times to  $1.4 \pm 1.0$  times ( $P < 0.001$ ); water intake volume decreased from  $2287.5 \pm 577.1$  ml to  $1982.4 \pm 524.3$  ml ( $P < 0.001$ ); Nocturnal Polyuria index (NPI) was also significantly improved from  $30.2 \pm 7.5\%$  to  $27.7 \pm 7.3\%$  ( $P < 0.001$ ). In the F group, the mean estimated salt intake increased from  $9.6 \pm 1.3$  g to  $11.0 \pm 1.8$  g ( $P < 0.001$ ); the number of nocturia worsened from  $2.3 \pm 1.1$  times to  $2.7 \pm 1.1$  times ( $P < 0.001$ ); water intake volume increased from  $2262.2 \pm 589.2$  ml to  $2540.3 \pm 604.9$  ml ( $P < 0.001$ ); the NPI showed no change (from  $30.8 \pm 8.3\%$  to  $30.5 \pm 7.9\%$ ;  $P < 0.583$ ).

In the S group, the CLSS indicated not only that Q1 (diurnal frequency) was improved from  $0.8 \pm 0.9$  to  $0.4 \pm 0.7$  ( $P < 0.001$ ) and Q2 (nocturia) was improved from  $1.9 \pm 0.6$  to  $1.3 \pm 0.8$  ( $P < 0.001$ ), but also that Q3 (urgency) was significantly improved from  $1.0 \pm 1.0$  to  $0.9 \pm 1.0$  ( $P = 0.001$ ) and the score of the quality of life (QOL) was significantly improved from  $3.6 \pm 1.2$  to  $2.7 \pm 1.3$  ( $P < 0.001$ ). In addition, the improvement of nocturia and the salt reduction rate with a receiver operating characteristic curve (ROC) showed an area under the curve (AUC) of 0.757. When the cut-off value for salt reduction rate was defined as 4.83%, the sensitivity and specificity were 92.8% and 53.1%, respectively, for the predicting improvement of nocturia.

#### Interpretation of results

In this clinical study performed in patients with nocturia who were diagnosed with excessive salt intake, the S group showed a significant decrease of nighttime frequency, nocturnal urine volume, NPI and urinary urgency as well as improved QOL. The main cause of improvement of nocturia and nocturnal urine volume was thought to be decreased water consumption due to salt intake restriction. However, it is very interesting that urinary urgency was also improved. In this regard, further examination is required.

#### Concluding message

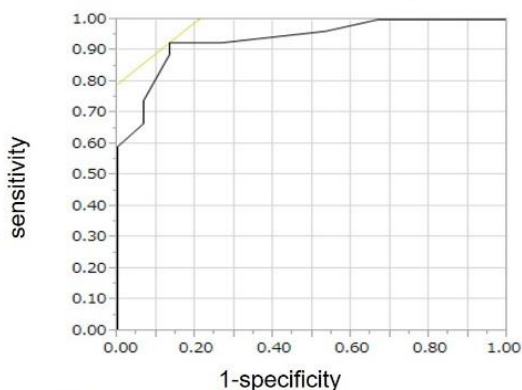
For patients with excessive salt intake who had urinary symptoms, especially nocturia, salt intake restriction can be considered as a treatment option and as a part of lifestyle guidance. Even for patients who have not responded to current drugs for nocturia, salt intake restriction can be considered when they are diagnosed with excessive salt intake.

Changes of salt intake volume and urological parameters in two groups						
	S group			F group		
	0W	12W	P value	0W	12W	P value
Estimated daily salt intake (g/day)	10.7 ± 2.3	8.0 ± 2.1	< 0.001	9.6 ± 1.3	11.0 ± 1.8	< 0.001
Daytime frequency	7.7 ± 2.4	6.4 ± 2.0	< 0.001	7.6 ± 2.5	8.4 ± 2.6	< 0.001
Nighttime frequency	2.3 ± 0.9	1.4 ± 1.0	< 0.001	2.3 ± 1.1	2.7 ± 1.1	< 0.001
Fluid intake volume (ml/day)	2287.5 ± 577.1	1982.4 ± 524.3	< 0.001	2262.2 ± 589.2	2540.3 ± 604.9	< 0.001
Voided volume (ml)	244.4 ± 24.5	255.8 ± 30.8	< 0.001	241.9 ± 24.7	238.7 ± 23.0	< 0.001
Diurnal urine volume (ml)	1679.7 ± 492.0	1412.5 ± 406.1	< 0.001	1636.1 ± 494.9	1821.9 ± 505.6	< 0.001
Nocturnal urine volume (ml)	702.0 ± 185.4	538.8 ± 195.0	< 0.001	705.1 ± 227.5	781.6 ± 224.1	< 0.001
Nocturnal polyuria index (%)	30.2 ± 7.5	27.7 ± 7.3	< 0.001	30.8 ± 8.3	30.5 ± 7.9	0.583

Comparison between two groups on *CLSS						
	S group			F group		
	0W	12W	P value	0W	12W	P value
Q1. Diurnal frequency	0.8 ± 0.9	0.4 ± 0.7	< 0.001	0.9 ± 1.0	1.1 ± 0.9	< 0.001
Q2. Nocturia	1.9 ± 0.6	1.3 ± 0.8	< 0.001	1.9 ± 0.6	2.0 ± 0.6	0.041
Q3. Urgency	1.0 ± 1.0	0.9 ± 1.0	0.001	1.0 ± 0.9	1.2 ± 0.9	< 0.001
Q4. Urgency incontinence	0.7 ± 0.9	0.6 ± 0.9	< 0.001	0.6 ± 0.8	0.9 ± 0.9	< 0.001
Q5. Stress incontinence	0.6 ± 0.9	0.6 ± 0.9	< 0.218	0.5 ± 0.8	0.5 ± 0.8	< 0.993
Q6. Slow stream	1.3 ± 1.1	1.2 ± 1.1	0.039	1.3 ± 1.1	1.3 ± 1.1	< 0.259
Q7. Strain	1.0 ± 1.2	0.9 ± 1.1	0.382	0.9 ± 1.1	1.0 ± 1.2	0.145
Q8. Incomplete emptying	0.9 ± 1.1	0.9 ± 1.1	0.141	0.8 ± 1.0	0.8 ± 1.0	0.405
Q9. Bladder pain	0.3 ± 0.7	0.3 ± 0.7	0.526	0.3 ± 0.6	0.3 ± 0.7	0.275
Q10. Urethral pain	0.2 ± 0.6	0.2 ± 0.6	0.082	0.2 ± 0.5	0.2 ± 0.5	0.310
QOL index	3.6 ± 1.2	2.7 ± 1.3	< 0.001	3.2 ± 1.2	3.7 ± 1.4	< 0.001

\*: Core Lower Urinary Tract Symptom Score

Receiver Operation Characteristic curve for the prediction of nocturia improvement



Area under the curve=0.757  
Cutoff value of salt reduction rate = 4.83 %  
Sensitivity=92.8%  
Specificity=53.1%

#### References

1. Matsuo T, Miyata Y, Sakai H. Int J Urol. 2017 Mar 14. doi: 10.1111

#### Disclosures

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