

RENAL FUNCTION IN NOCTURIC PATIENTS WITH POLYURIA AND NOCTURNAL POLYURIA.

Hypothesis/aims of study

Nocturia, defined as waking at night to void, is caused by number of factors including nocturnal polyuria, a low functional bladder capacity, a combination of both and polyuria [1]. Different pathophysiological mechanisms can contribute to the development of polyuria and nocturnal polyuria: disturbances in water diuresis, osmotic diuresis and glomerular filtration. The aim of this study was to investigate renal function in nocturic patients with polyuria and nocturnal polyuria.

Study design, materials and methods

A total of 277 patients $\geq 18 \leq 55$ years of age with complaints of urinary incontinence were included. 143 women had stress incontinence, 43 - urge incontinence and 91 - mixed incontinence. The overall prevalence of nocturia was $34.7 \pm 2.9\%$ (96 women); $24.5 \pm 3.6\%$ (35 women) in stress incontinence, $46.5 \pm 7.6\%$ (20 women) in urge incontinence ($p < 0.01$) and $45.1 \pm 5.2\%$ (41) in mixed incontinence ($p < 0.01$). The frequency of polyuria (24-urine volume of 40 mL/kg bodyweight or above) was $7 \pm 2.1\%$ in stress incontinence, $11.6 \pm 4.9\%$ in urge incontinence and $9.9 \pm 3.1\%$ in mixed incontinence ($p > 0.05$). The frequency of nocturnal polyuria (nocturnal volume / 24-h urine volume of 0.20 or above) was $17.5 \pm 3.2\%$ in stress incontinence, $27.9 \pm 6.8\%$ in urge incontinence and $25.3 \pm 4.6\%$ mixed incontinence ($p > 0.05$). All participants performed 24h-urinecollection to determine the voided volumes and the levels of creatinine, osmolality, sodium, magnesium and potassium for each sample. All urine samples collected for 24 h were divided into two 12-h portions: night portion (23:00-07:00) and day portion (07:00 -23:00). A blood sample was taken during the 24- urinecollection to determine the levels of creatinine, osmolality, sodium, magnesium and potassium.

Results

Lack of significant differences between the studied parameters in patients with nocturnal polyuria and polyuria and various types of urine incontinence has allowed to unite all samples of patients with polyuria ($n=24$) and nocturnal polyuria ($n=60$) for the further analysis. In patients with polyuria and nocturnal polyuria the glomerular filtration rate was normal, whereas diuresis and solute (sodium, magnesium, potassium) excretion in night samples in nocturnal polyuria and both in night and day samples in polyuria were increased. The higher diuresis and the higher solute excretion observed in nocturnal polyuria and polyuria are accompanied by an increase of free water reabsorption. In nocturnal polyuria and polyuria a high correlation was found between the free water reabsorption and solute excretion (table 1). This occurs against the background of the high night and day osmotic concentration. This study showed that the higher diuresis is accompanied by a reduction of ion reabsorption, firstly sodium and magnesium; as a result a higher excretion of solutes and water is observed. Comparison of the rise in the sodium and magnesium ion excretion allows the localization of the disturbance of the renal function in the studied forms of nocturnal polyuria and polyuria.

Interpretation of results

The thick ascending limb is known to reabsorb up to one-quarter the filtered sodium and about a half the filtered magnesium, while in subsequent parts of the distal tubule and in collecting ducts there is reabsorption of sodium ions but almost no magnesium ions are reabsorbed [2]. These results suggest there is a reduction of ion reabsorption in the thick ascending limb of the Henle loop in incontinent women with nocturnal polyuria and polyuria. Due to this defect, reabsorption of ions and water is decreased; as a result, larger volumes of fluid enter the collecting ducts.

Concluding message

Changes in kidney function in nocturnal enuresis appear to be due to a decrease in the water and ion reabsorption in the thick ascending limb of Henle's loop.

Table 1

Relation between diuresis, free water reabsorption and osmolal clearance; free water reabsorption, diuresis and solute excretion in incontinent women with nocturnal polyuria and polyuria

Parameters	Nocturnal polyuria				Polyuria			
	7.00-23.00		23.00-7.00		7.00-23.00		23.00-7.00	
	r	p	r	p	r	p	r	p
V-Cosm	0.74	0.01	0.81	0.01	0.68	0.01	0.72	0.01
T ^C H ₂ O- Cosm	0.68	0.01	0.77	0.01	0.76	0.01	0.85	0.01
T ^C H ₂ O-U _{Na} V	0.73	0.001	0.77	0.001	0.69	0.001	0.64	0.001
T ^C H ₂ O -U _{Mg} V	0.65	0.001	0.54	0.01	0.72	0.001	0.68	0.001
V- U _{Na} V	0.77	0.001	0.55	0.01	0.71	0.001	0.79	0.001
V- U _{Mg} V	0.74	0.001	0.68	0.001	0.57	0.01	0.47	0.05

References

1. Clinical guidelines for nocturia. Committee for Establishment of the Clinical Guidelines for Nocturia of the Neurogenic Bladder Society. Int. J. Urol. 2010;17(5):397-409.
2. Greger R. Renal handling of the individual solutes of glomerular filtrate. Comprehensive human physiology. Eds. Greger R., Windhorst U. Berlin, Heidelberg: Springer. 1996; 2:1517-1544.

Disclosures

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