

THE EFFECTS OF MELATONIN ON THE RESPONSE TO KCl AND CARBACHOL IN THE RAT URINARY BLADDER

Hypothesis / aims of study

Nocturia is thought to be one of the most bothersome symptoms in lower urinary tract symptoms. Sugaya K. et al. have reported that serum levels of melatonin at night were significantly lower in elderly persons with nocturia, compared with patients without nocturia (). Melatonin is the important substance for the quality of sleep. The hypothesis whether the abnormal circadian change of serum melatonin level, in other words, its lower level at night in elderly may affect the bladder and the voiding behaviour is unclear. The aims of this study are whether melatonin can change the contractility of the bladder, and furthermore has different property in young and aged rat bladder.

Study design, materials and methods

Urinary bladders were obtained from 10 to 12 weeks old (young) and 18 to 20 months old (aged) male Wistar rats. After pentobarbital injection bladder were excised and the longitudinal muscle strips (2x10mm) were mounted in 10ml organ baths containing Krebs-Heinsleit solution at 37°C with 95% oxygen and 5% carbon dioxide. The changes of tension were measured isometrically with a force displacement transducer. KCl (60mM) and carbachol (0.1 to 10uM) were used as stimulants in this experiment. After measuring the contraction to control stimulation with each stimulant followed by washing with normal Krebs-Heinsleit solution, muscle strips were pretreated with melatonin (0.01 to 10) for 20 minutes and stimulated with same stimulants. The changes of tension were compared between control and melatonin-treated bladders in young and aged rat groups.

Results

- 1) There were no age-related changes on the response to KCl and carbachol in the rat urinary bladder.
- 2) With melatonin, the response to KCl and carbachol decreased in concentration-dependent manner.
- 3) The effect of melatonin in decreasing response to KCl and carbachol in the aged rat bladder were not significantly different from the young one in corresponding concentration of melatonin and stimulants.

		Stimulants			KCl 60mM
		CCh (log M)			
		-7	-6	-5	
Young rats					
Magnitude of contraction (g/100mg bladder)					
Control		11.0±1.7	23.4±2.5	34.6±1.6	22.7±2.3
	-8	10.2±1.1	23.4±3.0	33.8±2.6	22.0±2.3
Melatonin (log M)	-7	8.5±1.3*	20.3±3.2	32.6±2.2	19.1±4.3
	-6	7.7±0.7**	18.4±3.1**	29.6±2.0**	15.4±3.1*
	-5	6.7±0.9**	18.0±2.4**	29.0±1.8**	15.7±1.2*
Aged rats					
Magnitude of contraction (g/100mg bladder)					
Control		11.1±2.0	22.4±1.8	34.1±3.4	24.1±0.8
	-8	10.3±1.6	22.0±2.3	33.5±2.4	23.9±1.4
Melatonin (log M)	-7	8.8±1.7	20.1±1.4	31.7±2.6	20.5±1.5*
	-6	7.4±1.7**	19.0±2.2*	30.1±1.7	15.6±2.3**
	-5	6.2±1.2**	16.7±1.4*	29.3±3.4*	14.8±2.7**

**p<0.01; Significantly different from control value with each stimulant

*p<0.05; Significantly different from control value with each stimulant

Interpretation of results

These results showed that melatonin had the inhibitory property of KCL- and carbachol-induced contraction in the concentration-dependent manner. But no difference was found between young and aged bladders in these properties.

Concluding message

The change of inhibitory property of melatonin with aging in the rat urinary bladder was not found in this study. The phenomenon that the serum level of melatonin, which decreases the contractility of the urinary bladder, does not rise at night may influence more frequent voiding at night in elderly.

Reference

1. Biochemical analysis of nocturia in the elderly. Neurourol Urodyn 20: 458-460, 2001