

HAEMODYNAMICS CHANGES DURING BLADDER FILLING AND MICTURITION IN NORMAL VOLUNTEERS

Aims of Study

Micturition is a complex act which activates many areas in the brain and neurological reflexes. Studies in animals have investigated the haemodynamic changes during micturition and bladder filling. The effects of bladder filling in animals experiments showed an increase in arterial blood pressure and an increase in heart rate (1,2). However these observations have limited impact in the knowledge of human physiology because done in animals and during anaesthesia which alters cardiovascular reflex responses. We performed such investigation in normal men.

Methods

The study was performed in 75 healthy male volunteers aged 20-70 years. The arterial pressure (systolic arterial pressure, diastolic arterial pressure, mean arterial pressure) was continuously recorded by plethysmographic technique, the cardiac index was recorded by impedance cardiography (ICG 572). Both the signals were simultaneously used to calculate the total peripheral vascular resistance index. Cardiac index and total peripheral vascular resistance index were recorded during empty bladder, during physiologic bladder filling and during voiding both in sitting position and in upright position. In all subject the micturition was performed in upright position.

A statistical analysis by Student's test was carried out to verify any significative differences among the above described parameters both in sitting position and upright position.

Results

They are reported in table 1 and 2.

	SAP (mm/Hg)	DAP (mm/Hg)	MAP (MM/Hg)	CI (L/min/m ²)	TPVRI (dyne x sec x cm ⁻⁵ /m ²)
empty bladder	121.1±19.4	67.2±12.7	85.2±14.1	2.96±0.62	2412.3±659
Student's test	P<0.0001	P<0,0001	P<0.0001	P<0.005	P<0.0001
bladder filling	141.4±20.9	78.4±14.5	99.4±15.4	2.78±0.58	2983±753.3
Student's test	P<0.0001	P<0.004	P<0.0001	P<0.0001	n.s.
voiding	163.5±25.7	90.9±17.5	115.1±18.8	2.97±0.63	3219.3±773.4

Tab.1 : evaluation in sitting position

	SAP (mm/Hg)	DAP (mm/Hg)	MAP (MM/Hg)	CI (L/min/m ²)	TPVRI (dyne x sec x cm ⁻⁵ /m ²)
empty bladder	123.6±20.0	71.5±13.0	88.9±14.8	3.11±0.61	2382.6±625.5
Student's test	P<0.0001	P<0.0001	P<0.0001	P<0.0008	P<0.0001
bladder filling	146.8±23.8	82.3±14.9	103.8±16.5	2.95±0.56	2905.9±662.7
Student's test	P<0.0001	P<0.004	P<0.0001	n.s.	n.s.
voiding	163.5±25.7	90.9±17.5	115.1±18.8	2.97±0.63	3219.3±773.4

Tab.2 : evaluation in upright position

Legends:

SAP= systolic arterial pressure; DAP= diastolic arterial pressure

MAP= mean arterial pressure; CI= cardiac index; TPVRI= total peripheral vascular resistance index

n.s.= not significant

Conclusions

These results showed, as previously described in animal models, that bladder filling and micturition causes an increase of arterial pressure by modifications of haemodynamics parameters in relation to the age. In particular bladder filling causes an increase of blood pressure in normal volunteers but, contrary to experimental models, a reduced heart rate is observed.

References

Afferent impulses in the nerves supplying the urinary bladder J. Physiol. 89, 1-13: 1937

The urinary bladder and cardiovascular reflexes. Int J. Cardiol. 23, 11-17: 1989