

CONSECUTIVE ICE WATER TESTING MAY UNMASK THE BLADDER COOLING REFLEX

Hypothesis / aims of study

Originally infusion of cold water was used as a test (the ice water test (IWT)) to discriminate between upper and lower motor neuron lesions in patients with spinal disease and urinary symptoms. The neurophysiologic correlate is the bladder cooling reflex, which is a spinally mediated C-fibre reflex (1). In infants this reflex is present, becomes negative around the age of 6 years, and may reappear by central neuropathology (2). In patients with neurogenic detrusor overactivity (DOA) the incidence of a positive ice water test has been reported at 65% (3). Because of this low incidence, the use of the IWT to discriminate between idiopathic and neurogenic DOA has been criticized. This study evaluates whether consecutive ice water tests in neurogenic patients with DOA could enhance its sensitivity. Preliminary results are presented.

Study design, materials and methods

33 patients with a neurological disorder who had preserved sensation of bladder filling and cystometrical proven DOA were studied. IWT was performed by instillation of 60 mL fluid at 4° C, and was considered positive if a detrusor contraction of > 30 cm H₂O was elicited. The test was repeated 3 times, or less if positive. The integrity of the afferent lower urinary tract (LUT) nervous system can be evaluated by testing the bladder electrical sensitivity (4). The electrical perception threshold (EPT) in the bladder was determined with square wave pulses at 2.5 Hz. A bladder EPT > 80 mA, which is the maximal current amplitude of the stimulator, was considered absence of electrical sensitivity.

Results

In 3 patients all 3 consecutive IWT's remained negative. The data from consecutive tests in patients with a positive IWT are listed in table 1.

Table 1 Consecutive IWT	Number of patients	Cumulative numbers	Percentage
+	21	21	64
- ; +	7	28	85
- ; - ; +	2	30	91

-: negative IWT; +: pos IWT

The EPT's in the bladder for the different groups are listed in table 2.

Table 2 Consecutive IWT	Bladder (mA)	EPT Absent electrical sensitivity (number of patients) [%]
+	30.4 ± 16.0	5 [24%]
- ; +	22.0 ± 11.3	1 [14%]
- ; - ; +	18.6 ± 5.1	0 [0%]
- ; - ; -	14.1 ± 1.6	0 [0%]

-: negative IWT; +: pos IWT

Interpretation of results

By repeating the IWT consecutively in patients with neurogenic DOA, the incidence of a positive IWT increases from 64% to 91%. If the initial ice water test is positive, more disturbances in the EPT are noted. Furthermore when the initial ice water test is negative and becomes positive in subsequent tests, the EPT value is lower. These data suggest that in the patients with a conversion of the bladder cooling reflex, LUT function is less neurogenically disturbed. Repeated exposure of cold fluids to the bladder may unmask the bladder cooling reflex, resulting ultimately in a positive IWT. This hypothesis is supported by the findings that

the electrical sensitivity of the bladder is less disturbed if the initial IWT's are negative. The physiological mechanism of the conversion of the reflex still remains unclear, but sensitisation of the afferent limb of this pathological reflex by repeated exposure to cold fluids may be one explanation.

Concluding message

Consecutive ice water testing may enhance the sensitivity of this test. Despite an initial negative ice water test, the bladder cooling reflex may be unmasked by repeated infusion of cold fluid.

- (1) A bladder-to-bladder cooling reflex in the cat. *J Physiol*, 42: 281-300, 1990.
- (2) The bladder cooling reflex and the use of cooling as stimulus to the lower urinary tract. *J Urol*, 162: 1890-1896, 1999.
- (3) The ice-water test in detrusor hyper-reflexia and bladder instability. *Br J Urol*, 79(2): 163-167, 1997.
- (4) Is abnormal electrosensitivity in the lower urinary tract a sign of neuropathy? *Br J Urol*, 72(5): 575-579, 1993.