

THE QUANTITATIVE BLADDER SENSORY TEST: EVALUATION OF THE NEUROSELECTIVE CURRENT PERCEPTION THRESHOLD OF THE BLADDER SENSORY TO IDENTIFY PATIENTS WITH OVERACTIVE BLADDER ASSOCIATED WITH SENSORY DYSFUNCTION

Hypothesis / aims of study

Pharmacotherapy with anticholinergics to control detrusor overactivity has been initially indicated for overactive bladder (OAB). However, some significant cases are ineffective or refractory to the treatment. Diagnosing dysfunction for the specific subpopulation of bladder afferent fibers in the OAB could help guide therapeutic intervention as well as understand pathogenesis. Recently we reported the first application of a new quantitative neuroselective test of the current perception threshold (CPT) in the human bladder mucosal function using a Neurometer with an intravesical electrode (1). With this new modality, definitive hypersensitivity or hyposensitivity of the urinary sensory function could be determined using the CPT values, in supra-sacral spinal injury patients or in diabetic neuropathy patients, respectively. The objective of this study was to evaluate the impact of the Neurometer on identifying the subpopulation of OAB patients associated with sensory dysfunction. We described the relationship between conventional urodynamic parameters and CPT values in selective patients with OAB in whom initial anticholinergic pharmacotherapy was ineffective.

Study design, materials and methods

Thirty-six selected patients with OAB were enrolled in this study. All the patients complained of the symptoms of both frequency and urgency, and initial anticholinergic pharmacotherapy was not curative in any of them. After failure of the initial pharmacotherapy, both conventional water filling cystometry and measurement of CPT values in the bladder using a Neurometer were performed. CPT values (1=0.01mA) on the bladder wall using an intravesical electrophysiology catheter (Cordis Webster Inc, Baldwin Park, CA, USA) were measured using a Neurometer (Neuron, Baltimore, MD, USA), which emits graded alternating current stimuli at 2000, 250, and 5 Hz stimulation frequencies. These were able to selectively reflect the functions of the large myelinated fibers (A-beta-fibers), the small myelinated fibers (A-delta-fibers), and the un-myelinated fibers (C-fibers), respectively. The CPT values were determined as an average of both stimulus consistently detected and the stimulus that was consistently not detected. CPT values were compared with the values that were previously evaluated in healthy volunteers (controls) as well as in patients with diabetic neuropathy.

Results

Filling cystometry identified involuntary detrusor contraction in nine (25%) of the 36 patients. In six of the nine, the CPT values both at 250 Hz (A-delta-fiber) and 5Hz (C-fiber) were determined to be hypersensitive sensory dysfunction, compared with the means of the control values. In the remaining three of the nine, the CPT values of both A-delta-fibers and C-fibers were determined to be hyposensitive. The former (six) were considered to be OAB caused by detrusor overactivity associated with sensory dysfunction, and the latter (three) were considered to be OAB caused by primary detrusor overactivity. In 27 patients (75%) without involuntary detrusor contractions during filling cystometry, five were determined to be hypersensitive in both A-delta and C-fibers. The other four of the 27 were determined to be hypersensitive in only A-delta fibers, and two only in C-fibers. In the remaining 16 of the 27, CPT values were determined to be equivocal. As mentioned above, this test suggested a diagnosis of sensory bladder function in 20 (56%) of the 36 patients in whom initial anticholinergic pharmacotherapy was ineffective.

The bladder CPT value at 5Hz had significant linear correlation ($r=0.48$, $p=0.02$) to first sensation of bladder filling in filling cystometry. The CPT values at both 250 Hz and 5Hz in patients with OAB were significantly lower than those in patients with urinary dysfunction due to diabetic neuropathy.

Interpretation of results

The measurement of neuroselective CPT values could help to identify a subpopulation of OAB patients associated with sensory dysfunction.

Concluding message

When initial pharmacotherapy to control detrusor overactivity was ineffective in patients with OAB, the neuroselective evaluation of CPT of the bladder mucosal sensory may have impact for understanding individual pathogenesis as well as determining a therapeutic option.