

THE ASSESSMENT OF SENSORY FUNCTION OF THE LOWER URINARY TRACT AS PART OF THE NEUROLOGICAL WORK-UP OF PATIENTS WITH CAUDA EQUINA INJURIES.

Hypothesis / aims of study

Following a cauda equina or a conus medullaris lesion, neurogenic lower urinary tract dysfunction (NLUTD) may underpin on the afferent side dysfunction of bladder filling sensations and on the efferent side reduced bladder activity.

There is no doubt that neurophysiological testing has been, is and will be most important in developing a better understanding of lower urinary tract function (LUT). It was thought that a positive bethanechol test reveal a detrusor denervation hypersensitivity and the muscular integrity of an acontractile detrusor (1). The method to quantify the filling function and micturition, using a urodynamic investigation, is the gold standard for investigating NLUTD(2). This contains a combined bladder pressure measurement and bladder filling sensations during urodynamics. Determination of electrical perception threshold (EPT) in the bladder permits to investigate afferent LUT pathways and has been proposed to detect and differentiate neurologic bladder dysfunction(3). These tests may influence diagnosis or help in patient management.

The aim of the study was to find out the clinical impact of sensory evaluation in the LUT using cystometric sensory evaluation and determination of EPT in the bladder in cauda equina patients.

Study design, materials and methods

A total of 17 female and 14 male patients aged between 20 and 81 years old with a cauda equina injury were included in this study. All patients attended the urodynamic clinic as part of their diagnostic work-up, and were considered fully cooperative. For urodynamic investigation an 7.4 Fr 3 lumen catheter with 2 pressure lines was inserted transurethrally. The bladder was emptied at the start. Abdominal pressure was measured using a single lumen balloon catheter introduced in the rectum. All pressure lines were connected to a 6-channel urodynamic unit. Simultaneously, the vesical, urethral and rectal pressures were measured. All patients were evaluated using a standardized protocol, including cystometry and determination of the EPTs in the bladder.

After these initial tests, a subcutaneous injection of a muscarinic agonist (1,5ml of bethanechol chloride 5mg/ml) was given. After 15 minutes, urodynamic investigation and EPT determination were again assessed as described during initial investigations. The bladder was again emptied before the start of the second bladder filling. Detrusor pressure was monitored until bladder filling of 250 ml or an increase of detrusor pressure > 80 cmH₂O. The bethanechol test was considered positive if the detrusor pressure increases above 20 cmH₂O.

After these tests a single dose of 3 g fosfomycin was given orally to prevent lower urinary tract infection. The data were summarized by sample and descriptive parameters (mean and standard deviation). Computerised statistical analysis was done with SPSS 18.0. Values of $P < 0.05$ were considered statistically significant.

Results

Figure 1 shows the results of the different methods to evaluate the sensory evaluation in the LUT before and after bethanechol injection.

The bethanechol test was positive in 18 patients and negative in 13 patients. In the group of patients with a positive bethanechol test, bladder filling sensations during urodynamic was absent in 44% and decreased in 56%. These results showed no differences with the group of patients with a negative bethanechol test. In this group bladder filling sensation was absent in 46% and decreased in 54%.

EPT results showed significant differences between the bethanechol positive and negative group. EPT results are significant higher in the positive bethanechol test group ($p=0,012^*$ and $p=0,0057^\circ$). EPT results decrease significant in the bethanechol positive group ($p=0,025$) as well as in the bethanechol negative group ($p=0,006$)

No significant differences were measured on the skin of left arm between both groups, neither after a bethanechol injection.

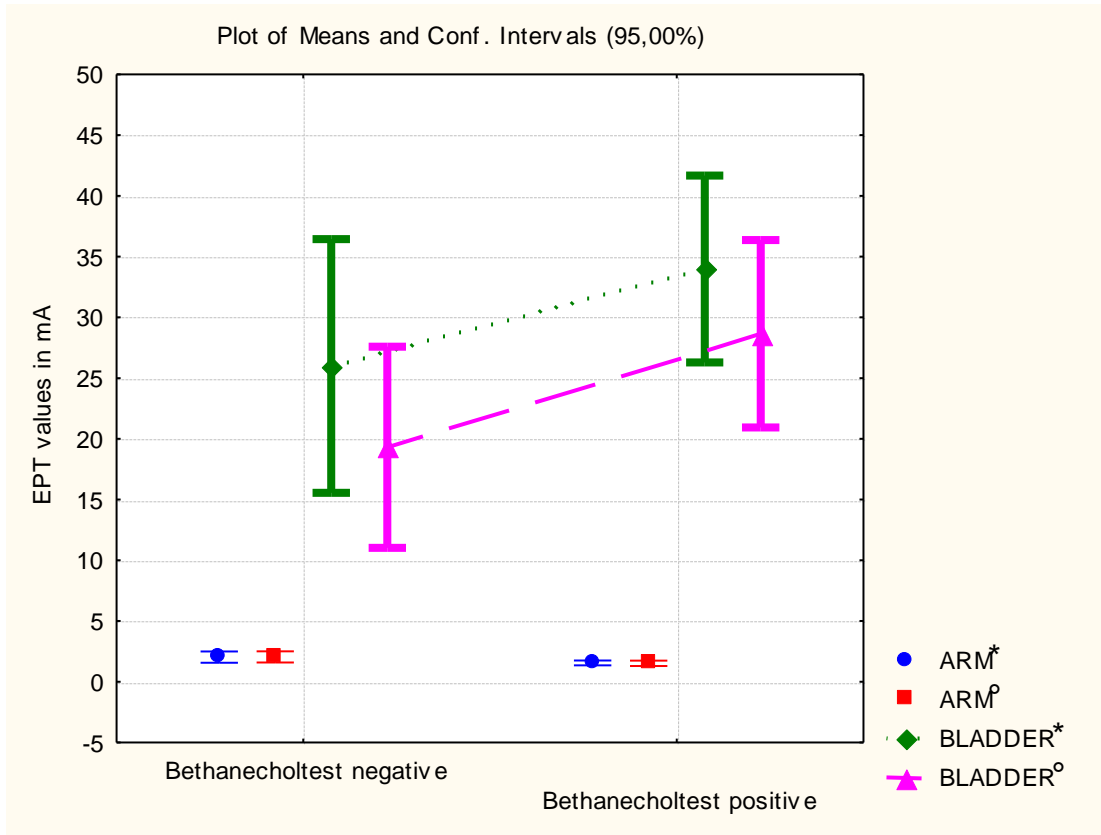


Figure 1: results are shown as mean \pm standard deviation *values before bethanechol injections °values 15 minutes after bethanechol injections

Interpretation of results

Bladder fullness sensations are conveyed to the spinal cord by the pelvic and hypogastric nerves. As the bladder fills, increasingly strong bladder afferents travel via synapses in the sacral cord to the brainstem and midbrain. These afferents arising from the bladder are mechanoreceptive and nociceptive. Clinical evaluation of the afferent system using sensations of bladder filling seems not to be very accurate in cauda equina injury patients. Moreover, this information could not distinguish complete or incomplete injuries. EPT determination in the bladder showed reproducible results. On the basis of these data, we concluded that bladder EPT can be used to confirm the results of the bethanecholtest and can be used to evaluate changes in the bladder sensory innervation.

Concluding message

In patients with a cauda equina injury, the functional state of the afferent nervous system can be clinically evaluated by the combination of the results of the bethanecholtest and bladder EPT. These tests should be included in the neurological work-up. Bladder filling sensations seems to be inconsistent for this group of patients.

References

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Disclosures

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