

THE EFFECTS OF BIOCHEMICAL CHANGES TO FILLING MEDIA DURING URODYNAMIC TESTING IN WOMEN WITH LOWER URINARY TRACT SYMPTOMS

Aims of Study

Detrusor muscle is sensitive *in vitro* to changes in the chemistry of its environment. Changes in osmolality and potassium concentration are known to affect its contractility, as are changes in the intracellular and extracellular pH. Urine composition varies greatly both in health and in disease. It is not clear however, the extent to which the intravesical environment influences bladder function. Urodynamic testing uses a standardised filling medium, usually normal saline. This study aimed to assess the impact of changes to the intravesical biochemical environment on urodynamic testing when compared to a normal saline control.

Methods

94 women, who were being investigated for lower urinary tract symptoms, consented to a repeat filling procedure. The filling phase of urodynamics was performed then repeated immediately. Each study used a test solution and a control with normal saline in random order. The solutions used were:

1. Hyperosmolar solution (NaCl 252 mM, NaHCO₃ 24mM). Calculated osmolality 552 mosm/l

2. A solution designed to change extracellular pH only (extracellular alkalosis) (NaCl 46mM, NaHCO₃ 96mM). The solution was gassed with 5%CO₂, 95% O₂. (Mean pH 8.3, calculated osmolality 284 mosm/l)

3 and 4 A solution was designed to try to influence intracellular and extracellular pH This using CO₂ to influence pH, which can cross cell membranes. This solution design was similar to that shown *in vitro* to have this influence (Journal of Physiology 1991: 432, 1-21)

This solution was studied along with a normocapnic control. The normocapnic control was solution 3 (NaCl 118mM, NaHCO₃ 24 mM, with gas 5%CO₂ / 95% O₂ -mean infusate pH 7.64)

The hypercapnic study solution designed to result in intracellular acidosis was solution 4 (NaCl 118mM, NaHCO₃ 24 mM, with gas 20%CO₂ / 80% O₂ -mean infusate pH 7.09, calculated osmolality 284 mosm/l)

5 A solution high in potassium (NaCl 76 mM, NaHCO₃ 24 mM, and KCl 54 mM)

Results

Solution/ study	Number of subjects	Median cystometric capacity difference expressed as %age of control fill (interquartile range in brackets)
1	29	0 (-26,9)
2	28	0 (-19,5)
3	24	-1 (-14,8)
4	16	-1 (-12,4)
5	13	3 (-9,25)
Order of fill	94	0 (-17,3)

The study data is expressed as 'control fill- test fill'

The order of fill data is expressed as 'second fill – first fill'

Some patients received three fills - the total numbers of subjects therefore do not add up, in order to avoid double counting in the order of fill group.

There were no significant effects of any changes in filling solution when compared to normal saline controls. This allowed an analysis of effect of order of fill, which also had no significant effect on urodynamic testing.

Conclusions

Urodynamic testing was unaffected by changes to intravesical chemistry which are known to affect detrusor cells *in vitro*. This suggests that the homeostatic mechanisms of the bladder are able to maintain a stable microenvironment for detrusor cells despite changes to bladder contents.