404

Nanri M[1], Ogawa M[1], Sakakibara H[1], Kiniwa M[1], Yamaguchi O[2]
1. *Taiho Pharmaceutical Co., Ltd.,* ***2.*** *Department of Urology, Fukushima Medical University School of Medicine*

IS ANY DIFFERENCE PRODUCED IN URODYNAMIC STUDIES WHEN CONDUCTED WITH WATER AND OWN URINE?

Hypothesis / aims of study

Urodynamic studies examine bladder function by putting water into the urinary bladder. However, any urodynamic study with water and own urine has never been reported. Therefore, we conducted the present study using them. Consequently, we observed pollakiuria when injecting own urine into the bladder at the same flow rate as water and attempted to elucidate its cause. Namely, the urine was diluted serially with distilled water to examine its effects on the study. Subsequently, we used the NaCl, KCl, and hyperosmotic (mannitol and glucose) solutions to verify the effects of urine components and osmotic pressure on urine accumulation. Furthermore, we measured biochemical parameters in the urine that was used in the study.

Study design, materials and methods

Under pentobarbital anesthesia, a polyethylene catheter was deployed in the doom of the bladder of 3 male beagle dogs to conduct cystometry. Two weeks after the procedure, the diluted volumes of own urine (0, 10, 20, 50, and 100%) or the KCl, NaCl, mannitol, and glucose solutions were put into the urinary bladder by continuous infusion (180 mL/hr) under unanesthetized and unrestrained conditions, and parameters for micturition (number of micturitions, micturition interval, volume voided per micturition, urine flow rate, and maximal bladder contraction rate) were measured for 4 hours after infusion onset. Furthermore, the concentrations of K^+, Na^+, and Cl^- in the urine used in the study were measured, together with bacteriology.

Results

A urodynamic study using the primitive urine was compared with that using water. Consequently, the number of micturitions increased 2.8-fold when using the primitive urine compared to water; micturition interval shortened, volume voided per micturition decreased, and maximal bladder contraction rate increased, thus verifying pollakiuria. The urine was diluted serially with distilled water. Consequently, the number of micturitions decreased and approximated micturition patterns that were observed with water. Furthermore, the KCl and NaCl solutions were used to conduct a similar study. Consequently, marked pollakiuria was observed with the $\geq$ 9.6% and $\geq$ 4.5% solutions of KCl and NaCl, respectively. Furthermore, no pollakiuria was observed with hyperosmotic solutions. The concentrations of electrolytes K^+, Na^+, and Cl^- in the urine used in the study were 170, 54, and 101 mEq/L, respectively (urinary concentrations of electrolytes KCl 9.6% and NaCl 4.5% were 1,287 and 770 mEq/L, respectively). Furthermore, the urine used resulted negative in bacteriology, and the possibility of bacterial urinary incontinence was denied.

Interpretation of results

In the present study, we used own urine instead of water to conduct an urodynamic study in dogs. Consequently, the urine of volume equivalent to that attainable with water could not be accumulated. We used the KCl and NaCl solutions as controls and found that high urinary concentrations of electrolytes were required to produce pollakiuria. Furthermore, no pollakiuria was observed when increasing osmotic pressure only. Usually, the urine contains a combination of different electrolytes and amino acids in addition to K^+, Na^+, and Cl^-. Therefore, it is difficult to specify causative substances for pollakiuria. Nevertheless, it was evident that urine accumulation rates decreased as urinary component concentrations increased. This observation suggests that osmotic pressure may act on pollakiuria only when combined with high urinary concentrations of electrolytes. Urine concentrations and urine components differ between dogs and humans, impeding a direct comparison between them. However, the accumulation of a more highly concentrated urine seems to stimulate micturition reflex of the urinary bladder and to accelerate voiding. Our hypothesis is that the presence of high urinary concentrations of electrolytes and amino acids -urine components- in the urinary bladder, together with osmotic pressure, has integrated effects and increases the permeability of electrolytes and other substances across the bladder epithelium, thus causing cell damage. Micturition reflex is considered to occur as part of defence mechanisms against the damage.

Concluding message

The present study revealed that urodynamic studies afford different results when using the urine and water and that the volume of accumulated urine decreased as concentrations of the urine increased. Micturition reflex to a concentrated urine is considered to be one of defence mechanisms of the urinary bladder.

Specify source of funding or grant	**NONE**
Is this a clinical trial?	**No**
What were the subjects in the study?	**ANIMAL**
Were guidelines for care and use of laboratory animals followed or ethical committee approval obtained?	**Yes**
Name of ethics committee	**The Institutional Animal Care and Use Committee of Taiho Pharmaceutical**