Bladder and erectile dysfunctions in the type 2 Diabetic Goto-Kakizaki rat

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OBJECTIVES

- Urolological functional complications such as bladder and erectile dysfunctions (ED) significantly impact the quality of life of diabetic patients.
- Most of experimental in vivo studies of ED/bladder dysfunction caused by diabetes have used type 1 diabetes models.
- A robust model for type 2 diabetes urological complications is lacking.

Aim of the study:
- Evaluate bladder and erectile function in the Goto-Kakizaki (GK) rat model for type 2 diabetes.
- Evaluate the responses to standard-of-care treatments for overactive bladder and erectile dysfunction in GK rats.

RESULTS

Erectile function evaluation: electrical stimulation of the cavernous nerve
After 5 minutes of baseline recording of simultaneously computed mean arterial pressure (MAP) and intracavernous pressure (ICP), the CN was stimulated (0.5, 1, and 4 s) at different frequencies (0.2, 0.4, 0.8, 1.0, and 1.6 Hz) at 3 minutes intervals in a randomized manner in order to assess the erectile responses. Erectile responses to ES CN were expressed as a ratio of ICP (mmHg) / MAP (mmHg) x 100. ICP being the difference between ICP and the fascial state, i.e. before stimulation and ICP during the plateau phase of the erectile response, and MAP the mean arterial pressure during the plateau phase, and as the ratio of AUCs[I]/MAP with AUC[I], with the area under the curve during the entire erectile response, measured from the beginning of the electrical stimulation until the end of the erectile response and determined using the ICP level in the fascial state before the onset of the stimulation.

CONCLUSIONS

- The type 2 diabetes GK rat model displays severe diabetic bladder dysfunction characterized by bladder overactivity. They display increased micturition pressures, increased bladder capacity and detrusor overactivity.
- The present study demonstrates that GK rats have many pathophysiological features in term of urological complications which are common to diabetic patients. They display diabetic bladder dysfunction characterized by detrusor overactivity, an increase in bladder capacity and micturition pressures. These rats also have an associated erectile dysfunction.
- Thus, GK rats represent a suitable and validated research model to better understand the pathophysiology of type 2 diabetes-associated bladder and erectile complications and to assess efficacy of new therapeutic agents targeting diabetic bladder and/or erectile dysfunctions.