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OSSABAW PIG AS A LARGE ANIMAL MODEL FOR DETRUSOR UNDERACTIVITY IN METABOLIC SYNDROME

Hypothesis / aims of study

Metabolic syndrome (MetS) is common and has detrimental effects on the bladder including detrusor underactivity[1]. The progression and mechanism are poorly understood. A large animal model for diabetic cystopathy was developed to explore this process[2]. The primary hypothesis is that a longitudinal decrease in bladder pressure will occur as MetS progresses. Future directions include defining biomarkers to drive early intervention.

Study design, materials and methods

Ten Ossabaw pigs underwent dietary modification consisting of a hypercaloric, atherogenic diet for 10 months to induce MetS and were compared to 5 lean pigs (normal diet). Urodynamic studies were performed at 7 and 10 months of MetS diet. Bladder pressure at capacity and compliance were used to define detrusor underactivity. Five indices of MetS were checked periodically (Table 1).

Results

During the final 3 months of MetS diet, ten pigs demonstrated decreased bladder pressure at maximum capacity (28.2±4.8* vs. 53.2±6.5*cc, p=0.001) and increased compliance (67.1 ±8.3* vs. 43.2±3.2* cc/cmH2O, p=0.005). Increased compliance was also noted in the MetS animals when compared with the 5 lean pigs (67.1± 8.3*vs. 28.3± 3.1* cc/cmH2O, p=0.006) after 10 months on MetS diet. MetS was confirmed (Table 1; data are mean ± SEM). Mean pressures for the different groups are found in Table 2 (data are mean ± SEM).

Interpretation of results

Both Lean and MetS groups began with similar urodynamic pressures, but after dietary treatment the MetS group exhibited significantly decreased bladder pressure at capacity, as hypothesized. The advantage to the large animal model is that volumes and pressures are similar to what one might find in humans and the same urodynamic equipment can be used. This has never been done with a large animal model for MetS and the model can also be modified to exhibit type 1diabetes for future investigation. Urinary and tissue biomarkers will be investigated in the future.

Concluding message

Detrusor underactivity occurred in MetS swine, suggesting the model exhibits hypoactive detrusor seen in humans with MetS, justifying further investigation for a longer duration and opening new doors to investigating the etiology and physiology of this phenomenon.

Table 1. MetS Indices validate the Ossabaw Pig model. *=SEM

	Metabolic Syndrome	**Lean**
Body Weight (kg)	105±5	54.7± 3
BP-Systolic (mmHg)	151.2 ± 1.9*	110.7± 2.6
BP-Diastolic	88.2 ± 1.9*	63± 2
Fasting Blood Glucose	114.3 ± 8*	87.3 ± 4.7
Total Cholesterol	535.6 ± 18*	57 ± 5.5
Triglycerides	59.6 ± 11.9*	25.7 ± 3.2*

Table 2. Mean values of urodynamic bladder pressure with empty and full capacity bladders. Compliance calculated in accordance with ICS standard definition.

MetS PRE-DIET n=5

Pves EMPTY	Pves FULL	compliance
9.0 ± 2.0	53.2 ± 6.5	43.2 ± 3.2
		*mean ± SEM

MetS POST DIET n=10

Pves EMPTY	Pves FULL	compliance
10.0 ± 1.2	28.2 ± 4.8	67.1 ± 8.3
		*mean ± SEM

LEAN n=5

Pves EMPTY	Pves FULL	compliance
7.6 + 2.2	45.6 + 6.1	28.3 + 3.1
		*mean + SEM

References
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Disclosures
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