

Effects of Ovariectomy and Estrogen Replacement on Bladder Blood Flow and Bladder Function in Female Rats

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Introduction & Objective

Menopause and subsequent estrogen deficiency have been implicated in the etiology of overactive bladder (OAB) in elderly females. Recently, attention has focused on ischemia of the bladder as a common pathophysiological mechanism for lower urinary tract symptoms (LUTS), including OAB. In the present study, we investigated the effects of ovariectomy (OVX) and estrogen replacement on bladder blood flow (BBF) as well as on bladder function in female rats.

Methods

All experimental protocols were approved by the Institutional Animal Care and Use Committee of the University of Yamanashi (Chuo, Yamanashi, Japan) and University Nihon (Koriyama, Fukushima).

All experiments were performed by using Virgin Sprague-Dawley rats(24-week old).

Group1 : SHAM, Group2 : OVX, Group3 : OVX + Estrogen replacement (OVX+E)
Estrogen replacement ; β -estradiol 1mg/kg/week s.c.

Four weeks after operation

BBF

Rats anesthetized with urethane and the anterior bladder was exposed.
A laser speckle blood flow imager (OMEGAWAVE, INC. Tokyo, Japan) was used to measure BBF.

Cystometric study in awaked rats

Three days before cystometry, rats were underwent catheter implantation.

The cystometric parameters :

maximum pressure (MP),baseline pressure (BP), threshold pressure (TP). micturition interval (MI)
bladder capacity (Bcap),micturition volume (MV), and post-void residual volume(PVR).

Statistical analysis All values were expressed as the mean \pm SEM. Data were analyzed using the Prism program (GraphPad Software, Inc.).

Results

Fig.1 – Bladder blood flow measurements in 9 SHAM, 9 OVX, and 10 OVX + E rats. Double asterisks indicate $p < 0.01$ SHAM and OVX + E groups versus OVX group.

Bladder blood flow

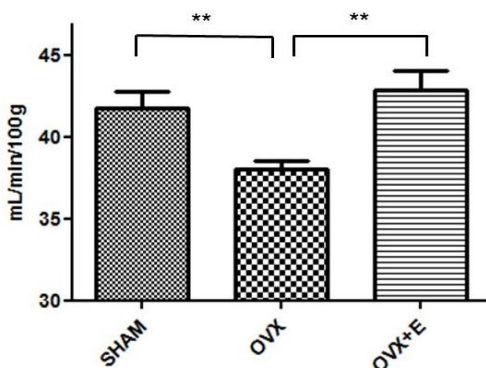
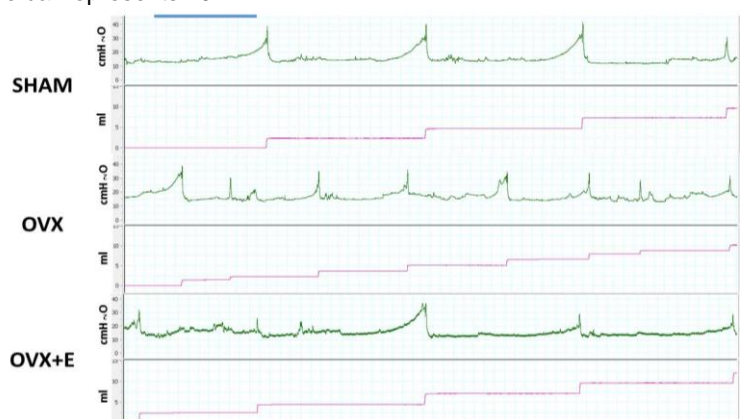


Table.1 – Cystometric parameters from 11 SHAM, 11 OVX, and 7 OVX+E rats.

	SHAM	OVX	OVX+E
Micturition intervals, min	12.64 \pm 0.6364	10.06 \pm 0.5270 **	12.29 \pm 0.5172 ††
Bladder capacity, ml	2.106 \pm 0.1061	1.676 \pm 0.08783 **	2.049 \pm 0.08619 ††
Micturition volume, ml	2.064 \pm 0.1016	1.636 \pm 0.08091 **	1.994 \pm 0.1023 †
Postvoid residual volume, ml	0.04177 \pm 0.01735	0.03959 \pm 0.01864	0.05430 \pm 0.01938
Baseline pressure, cmH2O	13.43 \pm 0.3871	14.23 \pm 0.3384	13.65 \pm 0.8035
Threshold pressure, cmH2O	30.06 \pm 0.9493	30.28 \pm 0.7899	29.78 \pm 1.005
Maximum pressure, cmH2O	41.60 \pm 1.497	39.81 \pm 1.051	42.94 \pm 4.348

SEM = standard error of the mean. Data shown as mean \pm SEM
 ** $p < 0.01$ versus sham † $p < 0.05$ versus OVX †† $p < 0.01$ versus OVX

Fig.2 – Typical cystometrogram recordings in SHAM, OVX, and OVX + E groups. Scale bar represents 10min.



Conclusions

The present study showed that OVX reduced BBF (ischemia of the bladder) and induced bladder hyperactivity that was characterized by decreases in MI and Bcap. Estrogen replacement was shown to restore BBF and bladder function to normal. Since bladder ischemia is known to cause functional and structural alterations of the bladder, decreased BBF and consequent ischemia may play a potential role in the development of bladder hyperactivity in rats with estrogen deficiency.

Conflict of Interest Disclosure

I have no potential conflict of interest to report