Fig.1

CASE	Motor states	Hoehn &Yahr	During UDS Urinary urgency	During UDS Voiding difficulty	DH	DSD	Bladder capasity (ml)	WFmax	Redidual urine (ml)	Qmax	AG number	UPmax (static)
1	off	4	+	+	+	-	210	6.31	20	8	22	-
	on	3	+	«	+	-	260	7.03	50	4 «	49 a	-
2	off	3	±	+	+	-	450	4.47	140	3	32	-
	on	2	±	«	+	-	400 «	4.5 a	60 «	3	32	-
3	off	5	+	+	-	-	280	7.81	20	19	-18	-
	on	3	a	«	-	-	210 «	8.1 a	10 «	16	-21	-
4	off	5	+	+	+	-	270	7.01	120	8	25	-
	on	3	"	«	+	-	230 «	7.96	35 «	13	18	-
5	off	4	+	+	-	-	410	6.2	10	10	12	-
	on	3	a	«	-	-	310 «	7.26	0 «	9 «	20 a	-
6	off	4	+	-	+	-	170	7.41	10	15	-3	-
	on	3	"	-	+	-	150 «	8.76	15	12	11 a	-
7	off	2	+	-	+	-	600	8.82	65	22	-31	-
	on	1	+	-	+	-	550 «	9.02	0 «	6 «	75 a	-
8	off	3	+	+	+	-	570	7.62	250	16	-10	47
	on	2	+	«	+	-	500 «	8.55	10 «	14	16 a	60 a
9	off	3	+	-	±	-	450	8.27	0	23	-23	60
	on	2	a	-	+	-	380 «	8.45	0	20	0 a	79 a
10	off	4	-	+	-	-	600	8.53	80	13	37	-
	on	3	-	«	-	-	590 «	8.75	0 «	10	50 a	-

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T. Mitsui, H. Kakizaki, S. Matsuura, K. Ameda, M. Yoshioka and T. Koyanagi

Hokkaido University School of Medicine, Sapporo, Japan

HYPOGASTRIC NERVE BLADDER AFFERENTS ARE INVOLVED IN FACILITATING AFFERENT EFFECTS OF CHEMICAL BLADDER IRRITATION ON MICTURITION REFLEX AND SPINAL C-FOS EXPRESSION

AIMS OF STUDY:

The hypogastric plexus(HGP) innervates the pelvic viscera via hypogastric nerves(HGN) and is implicated in the pelvic visceral pain[1]. A previous study has demonstrated that the bursting activation of bladder chemo-receptive afferent nerves in HGN rather than pelvic nerve (PLN) can signal noxious stimulation of bladder[2]. Since chemical irritation of the bladder is known to facilitate micturition reflex and spinal c-fos expression which is a functional marker for nociceptive neural activity[3,4], the present study was undertaken to evaluate the influence of HGN transection on the facilitating effects of chemical bladder irritation.

METHODS:

[continuous cystometry] Female Wistar rats were used and divided into 3 groups; (1)control(n=7), (2)capsaicin desensitization(n=6): capsaicin (75 mg/kg, subcutaneously) was administered 4 days before experiment, (3)HGP-transection(n=8): HGP was removed transabdominally under anesthesia with pentobarbital (40mg/kg, intraperitoneally[i.p]) 7 days before experiment. A polyethylene catheter(PE-60) was inserted into the bladder through the dome. Five days after catheter insertion, continuous cystometry was performed without anesthesia under a constant infusion of normal saline and then 0.1% acetic acid at the rate of 0.1 ml/min. After a 60-min stabilization period, intercontraction interval(ICI) and maximal voiding pressure(MVP) were compared in each group.

[c-fos expression] Spinal c-fos expression in urethane-anesthetized (1.2 g/kg, i.p.) female Wistar rats was examined with an immunohistochemical technique[4], following 2-hr infusion of saline(n=2) or 1% acetic acid(n=2) or 1% acetic acid with HGN transection in advance(n=2). The number of cells exhibiting c-fos immunoreactivity was counted at L1 and L6 spinal cord where HGN and PLN afferent terminals project, respectively. Specially, the number of c-fos positive cells was compared at 3 different regions; dorsal commisure, intermediolateral gray matter and dorsal horn.
Statistical analysis was performed by paired Student's t test and Mann-Whitney's U test.

RESULTS:

[continuous cystometry] (1)In control rats, acetic acid infusion elicited an irritative bladder responses characterized by a marked decrease in ICI (from 10.8±1.6 min during saline infusion to 6.1±1.9 min after acetic acid infusion, P<0.0002) and a marked increase in MVP (from 19.3±4.1 mmHg during saline infusion to 29.1±4.5mmHg after acetic acid infusion, P<0.002). (2)In capsaicin desensitization rats, there was no irritative bladder response; ICI:10.6±1.2 min in saline and 10.7±2.2 min in acetic acid, not significant(n.s.) or MVP:17.8±1.4 mmHg in saline and 18.3±1.7 mmHg in acetic acid (n.s.). (3)In HGP-transected rats, volume-evoked micturition reflex was preserved and there was no significant difference in ICI and MVP during saline infusion compared with control rats. After acetic acid infusion, although a marked increase in MVP was elicited (from 18.4±1.8 mmHg in saline to 29.3±3.1 mmHg in acetic acid, P<0.001), ICI did not decrease in HGP-transected rats(12.2±1.6 min in saline and 11.8±3.1 min in acetic acid, n.s.).

[c-fos expression] (1)L6 level: Acetic acid infusion with or without HGN transection significantly increased the number of c-fos positive cells at all 3 regions of L6 spinal cord compared with saline infusion, and there was no difference between rats with HGN intact or transected. (2)L1 level: HGN transection caused a significant decrease in the number of c-fos positive cells only at dorsal horn of L1 spinal cord following acetic acid infusion. The decrease was primarily noted in lamina I.

CONCLUSIONS:

(1)Acetic acid infusion in conscious rats provokes bladder irritative responses characterized by a decrease in ICI and an increase in MVP, both of which are mediated via capsaicin-sensitive nerves. (2)Since HGP transection prevented a decrease in ICI but not an increase in MVP following acetic acid infusion, nociceptive bladder afferents in HGN have a facilitating role in the urinary frequency caused by chemical bladder irritation. (3)Since HGN transection affects c-fos expression only at dorsal horn of L1 spinal cord, it is suggested that HGN bladder afferents convey nociception induced by chemical bladder irritation to the higher center for micturition, resulting in the facilitative modulation of micturition interval.

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Author(s):
S Lindström and C-H Jiang
Institution, city, country:
Department of Biomedicine and Surgery, Faculty of Health Sciences, University of Linköping, 581 85 Linköping, Sweden

Title (type in CAPITAL LETTERS, leave one blank line before the text):

REPEAT PERIODS OF ELECTRICAL STIMULATION PROLONG THE MODULATION OF THE MICTURITION REFLEX