

# Sensory Protein Expression and Urethral Mucosal Dysfunction in the Pathogenesis of Male Bladder Neck Dysfunction and Benign Prostatic Obstruction - 86



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## AIMS of Study

Bladder outlet obstruction (BOO) could be caused by anatomical (eg. benign prostatic obstruction, BPO) or functional (eg. bladder neck dysfunction, BND) etiologies. The dysfunction of urethra might play an important role in the pathophysiology of BOO. This study investigated the sensory proteins in urethral mucosa between BPO and BND.

## METHODS

We prospectively investigated urethra mucosal tissue obtained from the operations of transurethral incision and resection in 32 BND and 27 BPO patients, respectively. The specimen was divided into bladder neck (BN) and prostatic urethra two parts for comparison. The expressions of  $\alpha 1A$  and  $\beta 3$  adrenoreceptor, M2 and M3 muscarinic receptors, TGF- $\beta$ , and TRPV1 by Western blotting were compared between BPO and BND patients. In BND patients, urethral sensory protein expressions and autonomic nervous system (ANS) function evaluated with heart rate variability (HRV) were also compared between surgical success and failure groups.

## RESULTS

BPO patients had higher expression of  $\alpha 1A$  adrenoreceptor in BN but lower expression of M2 muscarinic receptor in prostatic urethra than BND patients (Table 1). In BND patients, success group had higher expressions of  $\alpha 1A$  adrenoreceptor and TRPV1 in both BN and prostatic urethra, higher expression of M3 muscarinic receptor in BN, and a higher LF/ HF (low frequency power/ high frequency power) ratio in HRV than failure group (Table 2). A positive correlation was noted between the expression of  $\beta 3$  adrenoreceptor in BN and HF power in HRV ( $r=0.570$ ), and also between the expression of TGF- $\beta$  in BN and LF/ HF ratio in HRV ( $r=0.525$ ).

Table 1. Sensory proteins expressions (Western blotting analysis) in the urethral mucosa of patients with BPO and BND.

	BPO (N=23)	BND (N=32)	P value
<b>Bladder neck</b>			
$\alpha 1A$ adrenoreceptor	1.06 ± 0.60	0.72 ± 0.51	0.027
$\beta 3$ adrenoreceptor	0.55±0.36	0.57±0.27	0.838
M2 muscarinic receptor	1.14±0.72	1.45±0.81	0.147
M3 muscarinic receptor	0.15±0.08	0.16±0.11	0.897
TGF- $\beta$	0.71±0.51	0.80±0.48	0.520
TRPV1	1.42±0.60	1.53±0.53	0.485
<b>Prostatic urethra</b>			
$\alpha 1A$ adrenoreceptor	0.88±0.60	0.72±0.48	0.283
$\beta 3$ adrenoreceptor	0.50±0.29	0.49±0.24	0.909
M2 muscarinic receptor	1.11±0.73	1.52±0.73	0.047
M3 muscarinic receptor	0.18±0.08	0.22±0.14	0.226
TGF- $\beta$	0.71±0.52	0.82±0.48	0.402
TRPV1	1.45±0.54	1.59±0.49	0.304

Table 2. Heart rate variability and sensory proteins expressions in the urethral mucosa between surgical success and failure groups of BND patients.

	Success (N=20)	Failure (N=8)	P value
<b>HRV</b>			
LF Power	142.53±194.59	17.40±16.26	0.175
HF Power	66.60±52.53	94.40±142.17	0.517
LF/ HF ratio	2.23±1.69	0.41±0.36	0.030
<b>Sensory proteins expressed in bladder neck</b>			
$\alpha 1A$ adrenoreceptor	0.89±0.50	0.32±0.21	0.004
$\beta 3$ adrenoreceptor	0.55±0.23	0.61±0.38	0.608
M2 muscarinic receptor	1.44±0.79	1.04±0.52	0.201
M3 muscarinic receptor	0.18±0.11	0.10±0.06	0.046
TGF- $\beta$	0.92±0.46	0.55±0.44	0.059
TRPV1	1.67±0.54	1.18±0.44	0.026
<b>Sensory proteins expressed in prostatic urethra</b>			
$\alpha 1A$ adrenoreceptor	0.79±0.45	0.34±0.28	0.016
$\beta 3$ adrenoreceptor	0.49±0.27	0.48±0.17	0.931
M2 muscarinic receptor	1.58±0.77	1.08±0.57	0.136
M3 muscarinic receptor	0.22±0.15	0.20±0.09	0.751
TGF- $\beta$	0.93±0.44	0.66±0.52	0.175
TRPV1	1.69±0.43	1.26±0.60	0.040

## CONCLUSIONS

BPO and BND patients had different sensory protein expressions in urethra mucosa, indicating their different pathophysiology. In BND patients, urethral mucosal dysfunction with distinct sensory protein expressions and ANS dysfunction might play important roles in the treatment outcome and reflex the complex pathophysiology.