ORIGINAL ARTICLE

Urodynamic Responses to Anal Stretch in Patients With Detrusor Sphincter Dyssynergia

Yu-Hui Huang, MD, Sung-Lang Chen, MD, Su-Ju Tsai, MD, Liu-Ing Bih, MD, Henry L. Lew, MD, PhD

ABSTRACT. Huang Y-H, Chen S-L, Tsai S-J, Bih L-I, Lew HL. Urodynamic responses to anal stretch in patients with detrusor sphincter dyssyngergia. Arch Phys Med Rehabil 2008; 89:1748-52.

Objective: To evaluate the urodynamic responses to anal stretch in patients with detrusor sphincter dyssynergia (DSD).

Design: Descriptive study.

Setting Rehabilitation hospital affiliated with a medical university.

Participants: Patients (N=36) with suprasacral spinal cord injury who had DSD confirmed on cystometrography.

Interventions: Not applicable.

Main Outcome Measures: Detrusor pressure, urethral pressure, and summated electromyogram of external urethral sphincter on cystometrography.

Results: The urodynamic responses to anal stretch were evaluated in the first half (time 1, 1–15s) and the second half (time 2, 16–30s) of the evaluation time period. The activity of external urethral sphincter was reduced significantly in both times 1 and 2 ($P<0.5$). The medians of reduction percentages were 33% and 35% for times 1 and 2, respectively. The change of detrusor pressure was not significant in either time 1 or time 2.

Conclusions: Anal stretch can reduce the activity of external urethral sphincter without significant change in detrusor pressure.

Key Words: Anus; Neurogenic bladder; Rehabilitation; Urethra; Urodynamics.

DETRUSOR SPHINCTER DYSSYNERGIA, defined as an involuntary contraction of the external urethral sphincter during detrusor contraction, is a common cause of bladder outlet obstruction in patients with SCI.[1,2] It causes impaired micturition and high intravesical pressure that leads to potentially life-threatening urologic complications such as recurrent urinary tract infections, vesicoureteral reflux, and hydronephrosis.[1,3] If left untreated, it could result in progressive damage to the kidneys.

Based on the observation that some paraplegic patients may void a substantial volume of urine during the performance of digital bowel programs, Kiviat et al[4] proposed an anal stretch technique to assist voiding in paraplegic patients. In their report, this technique reduced the external sphincter hypertonicity, but the patients needed simultaneous Valsalva maneuver or the assistance of a lumbosacral corset to produce adequate intra-abdominal pressure for voiding. Simultaneous relaxation of the detrusor and anal sphincter muscles by anal stretch was reported in other reports.[5-7] However, Sundin et al[8] reported, in a study with cats as subjects, that anal stretch did not change bladder contraction under low intravesical pressure (<10mmHg). Instead, it reduced bladder contraction under high intravesical pressure (15–25mmHg). Rodriquez and Awad[9] found that although vigorous anal stretch inhibited bladder contraction, mild stretch increased the intravesical pressure in 5 of 12 SCI patients. In a more recent study of 7 paraplegic patients, Shafik[10] reported that detrusor contraction was facilitated by rapid anal distension but not by gradual distension.

Despite these controversies, most researchers suggested that anal stretch could be a useful technique to facilitate voiding in paraplegic patients, except for those with anal fissures or intractable hemorrhoids.[5] However, previous studies either lacked measurable data or had very small sample sizes. An objective means to evaluate the effect of anal stretch is needed before one could reasonably recommend its clinical use.

In this study, we evaluated 36 patients with suprasacral SCI who exhibited findings of DSD. Videourodynamic examination, including triple-lumen cystometry (ie, urethrocystometry) and summated electromyogram, was used for the evaluation and quantification of detrusor and external urethral sphincter responses to anal stretch. Our intention was to reassess this technique, which has been proposed in the past but has not remained in general clinical use.

METHODS

Participants

All subjects were recruited from a rehabilitation hospital affiliated with a major medical school. The inclusion criteria were (1) patients with suprasacral SCI who were medically stable at the time of screening and recruitment and (2) the presence of hypertonicity of external urethral sphincter with or without detrusor contraction on videourodynamics. Hyperto-

List of Abbreviations

AIS	ASIA Impairment Scale
ASIA	American Spinal Injury Association
CIC	clean intermittent catheterization
DSD	detrusor sphincter dyssynergia
SCI	spinal cord injury

From the Department of Physical Medicine & Rehabilitation (Huang, Tsai, Bih) and Institute of Medicine (Huang), Chung Shan Medical University, Taichung City, Taiwan; Departments of Physical Medicine & Rehabilitation (Huang) and Urology (Chen), Chung Shan Medical University Hospital, Taichung City, Taiwan; and Division of Physical Medicine and Rehabilitation, Stanford University School of Medicine and PM&R Service, VA Palo Alto Health Care System, Stanford, CA (Lew).

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Reprint requests to Su-Ju Tsai, MD, Dept of Physical Medicine & Rehabilitation, Chung Shan Medical University, 1142 Section 3, Tay-Yuan Rd, Taichung City, 406, Taiwan, e-mail: *sujutsai@ms71.hinet.net.*

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Table 1: The Basic Demographic Data of 36 Patients With Suprasacral SCI

Characteristics	Values
Age (y)	46±15.6
Injury duration (d)	13.1±19.3
Sex	
Male	29 (80.6)
Female	7 (19.4)
Injury level	
Cervical	27 (75)
Thoracic	7 (19.4)
Lumbar	2 (5.6)
AIS grade	
A	13 (36.1)
B	10 (27.8)
C	6 (16.7)
D	7 (19.4)

NOTE. Values are mean ± SD or n (%).

nicity of external urethral sphincter was defined as markedly increased sphincter activity on electromyography with increasing bladder volume or poor relaxation of external sphincter at detrusor contraction. The exclusion criteria were (1) marked anal-rectal hemorrhoid on physical examination, (2) autonomic dysreflexia while undergoing urodynamic examination, (3) previous treatment of external urethral sphincter hypertonicity (including neurolysis, botulinum toxin injection, and sphincterotomy), and (4) infection of the perianal area. The ethics committee of Chung Shan Medical University Hospital approved the study program, and informed consent was obtained from each subject. A total of 36 patients were enrolled from August 2004 to July 2005. All of these patients had neurogenic bladder dysfunction, the upper motoneuron type, with hypertonicity of external urethral sphincter on urodynamic examinations. Injury levels were defined according to the ASIA classification system of SCI. Our patients had injury levels at the cervical, thoracic, or lumbar cord. All were suprasacral and resulted in DSD. Subjects were further divided according to the AIS into grades A, B, C, and D for further analysis. Basic demographic data of these patients are shown in table 1.

Procedures

Videourodynamic examinations performed with a Dantec Urodyn 5500 apparatus[a] included urethrocystometry and transperineal electromyogram. Urethrocystometry was performed by a triple-lumen catheter that could measure intravesical pressure and urethral pressure synchronously. The measuring point of urethral pressure is at the level of the maximal urethral pressure.[11] Transperineal electromyography of the external urethral sphincter was obtained through disposable concentric needle electrodes. The needle electrode placement in women is just lateral to the urethral meatus to a depth of 15mm. In male patients, the needle is inserted into the perineum at the midline about 1.5 to 2cm anterior to the anus. A gloved finger in the rectum monitors the position of the prostate while the electrode is being directed toward its apex. The final localization is made by monitoring motor unit activity electromyographically and by examining the needle position fluoroscopically.[12] The following parameters were recorded before, during, and after anal stretch: (1) detrusor pressure, (2) urethral pressure, and (3) summated electromyographic activity of external urethral sphincter. Urine leakage during anal stretch was also recorded.

Anal stretch was performed with an anal dilator (fig 1). This apparatus has 2 leaves attached to a holder. The width and length of the leaf were 1.5 and 5cm, respectively, which were similar to the width and length of adult human fingers. Baseline data were collected while the dilator was initially inserted and left in place (without opening) for 30 seconds. Then, it was opened to a 5-cm width for another 30 seconds while postdilatation measurements were recorded.

Data Analysis

All data collected during anal stretch were divided into the first half (time 1, 1–15s) and the second half (time 2, 16–30s) of the 30-second duration. The average detrusor pressure, urethral pressure, and summated electromyographic activity during 3 specific intervals (baseline, time 1, time 2) were used for analysis. The percentages of change in these 3 parameters were calculated as: (baseline value – time 1 or time 2 value)/baseline value.

All statistic analysis was performed by SPSS software.[b] Because the analysis of the Kolmogorov-Smirnov normality test revealed that our data were not normally distributed (we have some extreme values and small sample size), all analysis was done by the nonparametric method. We used the Friedman analysis of variance and post-hoc analysis by Wilcoxon signed-rank test to compare the difference of urodynamic parameters between these intervals. A Wilcoxon signed-rank test was also used to analyze the difference of summated electromyographic activity before and after anal stretching (time 1) within subgroups of the AIS. We used the Kruskal-Wallis method to compare the difference in summated electromyographic activity change percentage (of time 1) between patients with different SCI levels (per ASIA classifications). Wilcoxon rank-sum tests were used for post hoc comparisons and also to compare the differences between sex and duration after SCI (<6mo or ≥6mo). The level of significance was set at P less than .05.

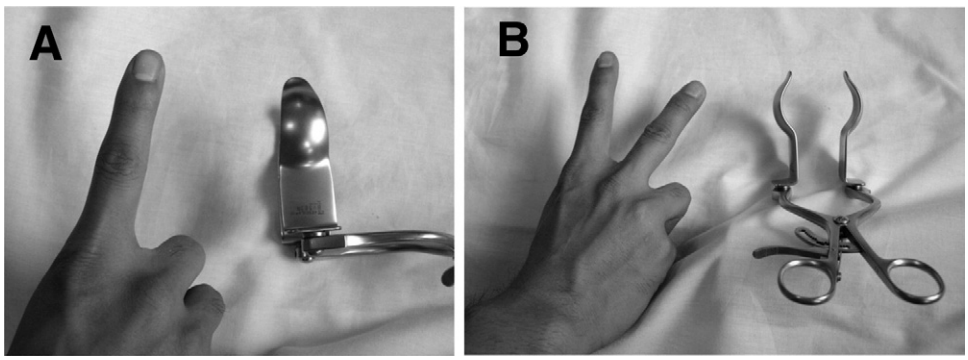

Fig 1. (A) The leaf size and (B) the opening width of the anal dilator (right) were similar to those of human fingers (left).