



## Video-Urodynamic Improvement of Trigonal BTX-A Injection for Patients with Poor Bladder Compliance Secondary to Spinal Cord Injury

Chen Hui<sup>1,2\*</sup>, Yang XH<sup>1</sup>, Huang MP<sup>1</sup>, Huang TH<sup>1</sup>, Liu QL<sup>1</sup>, Li QQ<sup>1</sup>, Yang XY<sup>1</sup>, Xiao XH<sup>1</sup>, Liu J<sup>1</sup>, Xie Keji<sup>2</sup> and Jiang Chonghe<sup>3</sup>

<sup>1</sup>Department of Urology, Guangdong Provincial Work Injury Rehabilitation Hospital and Jinan University, China

<sup>2</sup>Department of Urology, Qingyan City People's Hospital, Jinan University, China

<sup>3</sup>Department of Urology, Guangzhou First Municipal People's Hospital, China

### Abstract

**Objective:** To evaluate video-urodynamic improvement for trigonal BTX-A injection in patients with neurological poor bladder compliance.

**Methods:** 68 consecutive in patients with poor bladder compliance secondary to Spinal Cord Injury (SCI) received trigonal injections of BTX-A (300U) into the bladder from June 2014 to February 2017. All were evaluated video-urodynamic outcome included Detrusor Leak Point Pressure (DLPP), Bladder Compliance (BC) and Vesicoureteral Reflux (VUR) at baseline and 12 weeks post-injection.

**Results:** All outcomes improved significantly compared to baseline. The improvement percentage of DLPP (44.36%) and BC (77.13%). No patient developed unilateral or bilateral VUR.

**Conclusion:** Trigone-including BTX-A injection is safe and effective as the treatment for low BC and does not induce VUR.

**Keywords:** Video-urodynamic; Bladder trigone; Botulinum toxin A; Low bladder compliance; Spinal cord injury

### OPEN ACCESS

#### \*Correspondence:

Chen Hui, Department of Urology, Qingyan City People's Hospital, Guangdong Provincial Work Injury Rehabilitation Hospital and Jinan University, Guangzhou, China, E-mail: doc.chenhui@163.com

Received Date: 23 Jan 2018

Accepted Date: 20 Feb 2018

Published Date: 26 Feb 2018

#### Citation:

Hui C, Yang XH, Huang MP, Huang TH, Liu QL, Li QQ, et al. Video-Urodynamic Improvement of Trigonal BTX-A Injection for Patients with Poor Bladder Compliance Secondary to Spinal Cord Injury. *Clin Surg*. 2018; 3: 1919.

**Copyright** © 2018 Chen Hui. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

### Introduction

Detrusor Leak Point Pressure (DLPP) is characterized by the lowest value of detrusor pressure at which leakage is observed in the absence of abdominal strain or detrusor contraction [1]. Sustained DLPP is the most important risk factor for the function of upper urinary tract in patients with neuro-urological disorders, such as stroke, brain diseases and chronic spinal cord injury (SCI) [2]. Therefore, keeping the DLPP within safe limits has become a primary treatment goal for SCI patients [3]. Botulinum toxin A (Botox<sup>®</sup>, Allergan, Irvine, Calif) is recommended as the second-line treatment for those patients who have an inadequate response to or are intolerant to anticholinergic medication [4,5]. In the past ten years, intradetrusor injection of BTX-A was performed while avoiding the trigone to prevent VUR. To our knowledge, several studies reported satisfactory clinical results about combined detrusor-trigone BTX-A injections [6-12]. However, most of these studies were small and single-center experience. Therefore, encouraged by our satisfactory clinical effects, we performed this study to evaluate the efficacy and safety of combined detrusor-trigone BTX-A injections for patients with poor bladder compliance secondary to Spinal Cord Injury (SCI).

### Materials and Methods

Consecutive SCI in patients with poor bladder compliance (<20 ml/cm H<sub>2</sub>O) [1] were recruited in this trial from June 2014 to February 2017. Inserted A 23 gauge approximately 2 mm into the detrusor under local anesthesia or epidural anesthesia in the operating room. 300 U Botox<sup>®</sup> vials (100 U each) were reconstituted in a total of 30 ml sterile saline. Administer 24 injection sites into the bladder wall while 6 sites into the bladder trigone sparing a 5 mm distance to the vicinity of the ureteral orifices and the bladder neck (Figure 1). A16 Foley catheter had been inserted for 3 to 5 days after injection. The outcomes were the changes in the videourodynamic test evaluated at baseline, and at 12 weeks after injection: (1) incidence of vesicoureteral reflux (VUR); (2) detrusor

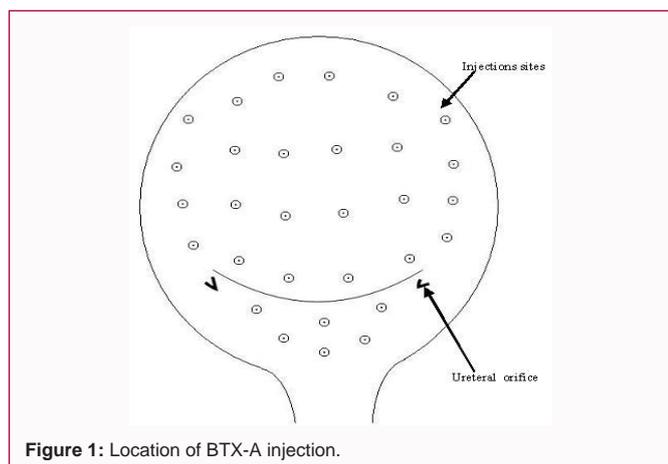


Figure 1: Location of BTX-A injection.

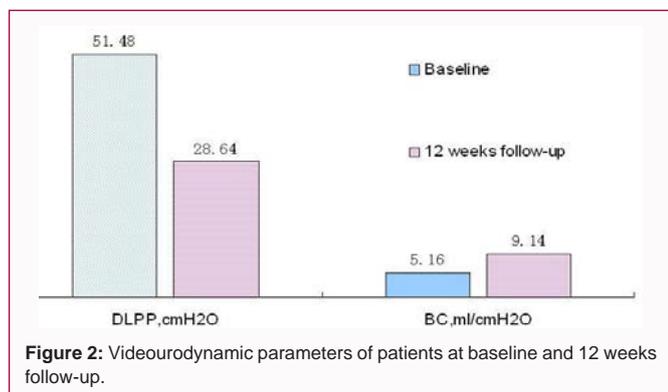


Figure 2: Videourodynamic parameters of patients at baseline and 12 weeks follow-up.

leak point pressure (DLPP); (3) Bladder Compliance (BC). The related adverse events were collected. The study was approved by the ethics committees and patients provided written informed consent before injection. Pair Student's t-test was used for comparison of DLPP, BC and results are presented as means  $\pm$  standard deviation. The chi-square test was used for categorical data. A P value of 0.05 or less was considered statistically significant. Statistical analyses were performed with SPSS 13.0 software (SPSS, Inc., Chicago, IL).

## Results

A total of 68 inpatients (55 male and 13 female) were enrolled in this trial. Patients mean age, mean weight, duration of injury were 38.81y, 50.24 kg, 10.19 months, respectively. 59 patients were AIS grade A, and other 9 AIS grade B (Table 1). No patient developed unilateral or bilateral VUR at week 12. Compared the baseline data, significant difference were present by week 12 for DLPP (51.48 cm H<sub>2</sub>O vs. 28.64 cm H<sub>2</sub>O,  $P < 0.001$ ) and BC (5.16 ml/cm H<sub>2</sub>O vs. 9.14 ml/cm H<sub>2</sub>O,  $P < 0.001$ ) (Figure 2). None of patients reported adverse events, such as nausea, vomiting, weakness in the respiratory.

## Discussion

Our study demonstrates that trigonal BTX-A injection does not induce VUR during the 12 week follow-up after injection. We also noticed our results similar to the preview studies [6-12]. One study found that not one of their 24 adults with OAB refractory to anticholinergic treatment who received trigone injection of BTX-A developed VUR during at 6-month follow-up [6]. A similar result was obtained in 10 women 6 weeks after treatment [7]. Interestingly, Kuo [8] found that the degree of renal hydronephrosis decreased with treatment in four of the five patients with baseline hydronephrosis

Table 1: Baseline characteristics of the participants.

Characteristic	Number of patients
	N = 41
Age, yr, mean (SD)	30.81 (16.59)
Gender, men, n (%)	55 (80.88)
Weight, kg, mean (SD)	51.24 (20.66)
Duration of injury, months, mean (SD)	10.19 (9.17)
AIS grade, A/B, n	59/9

AIS: The American Social Injury Association

after injection. Another study [9] also confirmed the safety of trigone injections of BTX-A in terms of development of VUR because the only patient in their series with VUR previous to the injection had it cured after BTX-A injection. Trigonal BTX-A injection has been proven effective in adults with neurological or non-neurological disorders. According to the guideline, keeping the DLPP within lower limits has become a primary treatment goal for Low BC [3]. The present trial reports significant improvements in these parameters were evident with the 300-U dose of BTX-A injection. It is reported that abundant sensory nerve fibers are particularly dense in bladder trigone, and smooth muscle of bladder trigone is sensitive to small pressure changes [13-24]. According to these studies, combined detrusor trigone BTX-A injections may help desensitize the bladder and thereby help to decrease detrusor pressure. No patients developed systemic or significant adverse events of treatment in this trial. A limitation of this study is that number of patients was relatively fewer. Therefore, further studies are warranted.

## Conclusion

Trigone-including BTX-A injection is safe and effective as the treatment for low BC and does not induce VUR.

## Acknowledgment

This study was supported by Medical Scientific Research Foundation of Guangdong Province, China (grant number B2017040).

## References

1. Stöhrer M, Goepel M, Kondo A, Kramer G, Madersbacher H, Millard R. The standardization of terminology in neurogenic lower urinary tract dysfunction: with suggestions for diagnostic procedures. International Continence Society Standardization Committee. *Neurourol Urodyn.* 1999;18(2):139-58.
2. Gerridzen RG, Thijssen AM, Dehoux E. Risk factors for upper tract deterioration in chronic spinal cord injury patients. *J Urol.* 1992;147(2):416-8.
3. Stöhrer M, Blok B, Castro-Diaz D, Chartier-Kastler E, Del Popolo G, Kramer G, et al. EAU guidelines on neurogenic lower urinary tract dysfunction. *Eur Urol.* 2009;56(1):81-8.
4. Marte A. Onabotulinumtoxin A for treating overactive/poor compliant bladders in children and adolescents with neurogenic bladder secondary to myelomeningocele. *Toxins.* 2013;5(1):16-24.
5. Schurch B, de Sèze M, Denys P, Chartier-Kastler E, Haab F, Everaert K, et al. Botulinum toxin type a is a safe and effective treatment for neurogenic urinary incontinence: results of a single treatment, randomized, placebo controlled 6-month study. *J Urol.* 2005;174(1):196-200.
6. Huang M, Chen H, Jiang C, Xie K, Tang P, Ou R, et al. Effects of botulinum toxin A injections in spinal cord injury patients with detrusor overactivity and detrusor sphincter dyssynergia. *J Rehabil Med.* 2016;48(8):683-7.

7. Citeri M, Spinelli M, Zanollo L, Scropo F, Macrellino E, Redaelli T. Botulinum toxin into the trigone in neurogenic overactive bladder non-responder to detrusor injection. *Eur Urol.* 2008;7(3):213.
8. Kuo HC. Bladder base/trigone injection is safe and as effective as bladder body injection of onabotulinumtoxinA for idiopathic detrusor overactivity refractory to antimuscarinics. *Neurourol Urodyn.* 2011;30(7):1242-8.
9. Pinto R, Lopes T, Frias B, Silva JA, Silva CM, Cruz C, et al. Trigonal injection of botulinum toxin A in patients with refractory bladder pain syndrome/interstitial cystitis. *Eur Urol.* 2010;58:360-5.
10. Hui C, Keji X, Chonghe J. Combined detrusor-trigone BTX-A injections for urinary incontinence secondary to neurogenic detrusor overactivity. *Spinal Cord.* 2016;54(1):46-50.
11. Manecksha RP, Cullen IM, Ahmad S, McNeill G, Flynn R, McDermott TE, et al. Prospective randomised controlled trial comparing trigone-sparing versus trigone-including intradetrusor injection of abobotulinumtoxin A for refractory idiopathic detrusor overactivity. *Eur Urol.* 2012;61(5):928-35.
12. Conte A, Giannantoni A, Gubbiotti M, Pontecorvo S, Millefiorini E, Francia A, et al. Intradetrusorial botulinum toxin in patients with multiple sclerosis: a neurophysiological study. *Toxins.* 2015;7(9):3424-35.
13. Patrick DL, Martin ML, Bushnell DM, Yalcin I, Wagner TH, Buesching DP. Quality of life of women with urinary incontinence: further development of the incontinence quality of life instrument (I-QOL). *Urology.* 1999;53(1):71-6.
14. Del Popolo G, Filocamo MT, Li Marzi V, Macchiarella A, Cecconi F, Lombardi G, et al. Neurogenic detrusor overactivity treated with english botulinum toxin a: 8-year experience of one single centre. *Eur Urol.* 2008;53(5):1013-19.
15. Cruz F, Herschorn S, Aliotta P, Brin M, Thompson C, Lam W, et al. Efficacy and safety of onabotulinumtoxinA in patients with urinary incontinence due to neurogenic detrusor overactivity: a randomised, double-blind, placebo-controlled trial. *Eur Urol.* 2011;60(4):742-50.
16. Ginsberg D, Gousse A, Keppenne V, Sievert KD, Thompson C, Lam W, et al. Phase 3 efficacy and tolerability study of onabotulinumtoxinA for urinary incontinence from neurogenic detrusor overactivity. *J Urol.* 2012;187(6):2131-9.
17. Grosse J, Kramer G, Stöhrer M. Success of repeat detrusor injections of botulinum a toxin in patients with severe neurogenic detrusor overactivity and incontinence. *Eur Urol.* 2005;47(5):653-9.
18. Stöhrer M. Diagnosis and treatment of bladder dysfunction in spinal cord injury patients. *Eur Urol Update Series.* 1994;3:170-5.
19. Castro-Diaz D. Surgery for the neuropathic patient. In: Incontinence P, Abrams, Editors. Health Publication: Plymouth. 2002;865-91.
20. Frankel HL, Coll JR, Charlifue SW, Whiteneck GG, Gardner BP, Jamous MA, et al. Long-term survival in spinal cord injury: a fifty year investigation. *Spinal Cord.* 1998;36(4):266-74.
21. Jamil F. Towards a catheter free status in neurogenic bladder dysfunction: a review of bladder management options in spinal cord injury (SCI). *Spinal Cord.* 2001;39(7):355-61.
22. Schurch B, Stöhrer M, Kramer G, Schmid DM, Gaul G, Hauri D. Botulinum-A toxin for treating detrusor hyperreflexia in spinal cord injured patients: a new alternative to anticholinergic drugs? Preliminary results. *J Urol.* 2000;164(3):692-7.
23. Cohen BL, Barboglio P, Rodriguez D, Gousse AE. Preliminary results of a dose-finding study for botulinum toxin-A in patients with idiopathic overactive bladder: 100 versus 150 units. *Neurourol Urodyn.* 2009;28(3):205-8.
24. Klein LA. Urge incontinence can be a disease of bladder sensors. *J Urol.* 1988;139(5):1010-4.