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# Effects of Botulinum toxin A injections combined with oral baclofen in treatment of patients with detrusor overactivity secondary to spinal cord injury

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**Abstract**

**Objective:** To explore the efficacy and safety of Botulinum toxin A(BTX-A) injections combined with oral baclofen in treatment of patients with detrusor overactivity secondary to spinal cord injury (SCI)

**Methods:** The clinical study was conducted from July 2022 to April 2025. A total of 50 patients (mean age, 44 years; 37 males and 13 females) with detrusor overactivity secondary to SCI participated in the study. The patients received 300 U BTX-A injected into the detrusor and took 30 mg of baclofen orally, 10 mg each time, three times a day. The effective outcomes included bladder compliance (BC), the incontinence quality of life (I-QOL) score, the maximum cystometric capacity (MCC), and the maximum detrusor pressure (MDP). Adverse events were recorded.

**Results:** After 4 weeks of treatment, compared to the baseline data, the patients' mean BC, I-QOL score, MDP and MCC improved significantly. The main adverse events included: hematuria (4.2%), urinary tract infection (4.5%), and mild myasthenia (5.2%).

**Conclusions:** The combined therapy of BTX-A and oral baclofen has demonstrated confirmed efficacy in treating spinal cord injury patients with NDO. However, further follow-up studies and observational research are needed to determine the long-term toxic side effects and whether the efficacy remains reliable for patients requiring repeated injections.

**Keywords:** Botulinum toxin A, detrusor overactivity, baclofen, spinal cord injury

## Introduction

In 2019, the incidence rate of spinal cord injury (SCI) in China was 16.47 per 100,000 people [1]. China has approximately 1.4 billion people, which means there are more than 230,000 new spinal cord injury patients each year. Detrusor overactivity (DO) refers to the detection of uninhibited detrusor contractions during the urodynamic examination in the filling phase [2]. When DO is caused by nervous system diseases (such as SCI, multiple sclerosis, etc.), it is called neurogenic detrusor overactivity (NDO). NDO can lead to life-threatening pathophysiological changes due to elevated intravesical pressure during the storage phase. These changes include vesicoureteral reflux, hydronephrosis, upper urinary tract infections, renal calculi (kidney stones), and renal insufficiency [3, 4, 5]. The primary clinical manifestations are urinary urgency and urgency urinary incontinence, which not only severely impair patients' quality of life but may also pose significant risks to their survival [6]. Intradetrusor injections of BTX-A have resulted in long-lasting effects on DO, and repeated injections appear to be possible without loss of efficacy [7, 8, 9, 10, 11, 12]. Baclofen reduces spinal hyperreflexia via central pathways, while BTX-A directly inhibits peripheral neuromuscular signal transmission [13]. The purpose of this study was to investigate effects of BTX-A injections combined with oral baclofen in treatment of patients with detrusor overactivity secondary to SCI.

## Methods

The clinical study was conducted from July 2022 to April 2025. A total of 50 patients（mean age, 44 years; male 37, female 13）with detrusor overactivity secondary to SCI participated in the study. The patients received 300 U BTX A injected into the detrusor and took 30 mg of baclofen orally, 10 mg each time, three times a day. 300 U BTX-A were reconstituted in 30 ml sterile saline (10 U/ml) and administered in 30 injections of 1 ml each, spaced 1 cm apart across the detrusor.All the patients underwent urodynamic study, and voiding diaries were recorded.The effective outcomes included bladder compliance (BC), the Incontinence Quality of Life (I-QOL) score, the maximum cystometric capacity (MCC), and the maximum detrusor pressure (MDP).Adverse events were recorded.The follow-up time was 1 month after the treatment.

## Results

After 4 weeks of treatment, compared to the baseline data, the patients' mean BC, I-QOL score, MDP and MCC improved significantly. The mean MCC increased from 188.4 to 288.2 ml, the mean BC increased from 14.2 to 23.4 ml/cm$H_2O$ (Fig.1), the mean I-QOL score was improved from 32.05 to 52.32, and the mean MDP was decreased from 61.6 to 36.9 cm$H_2O$ (1 cm$H_2O$ = 0.098 kPa) (Fig.2).The main adverse events included: hematuria (4.2%), urinary tract infection (4.5%), and mild myasthenia (5.2%).

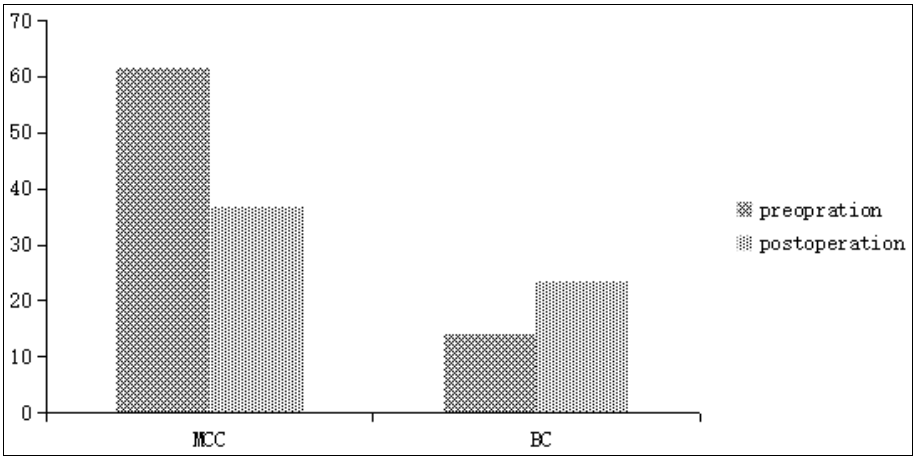


**Fig 1:** Improvement in MCC and BC between preopration and postoperation

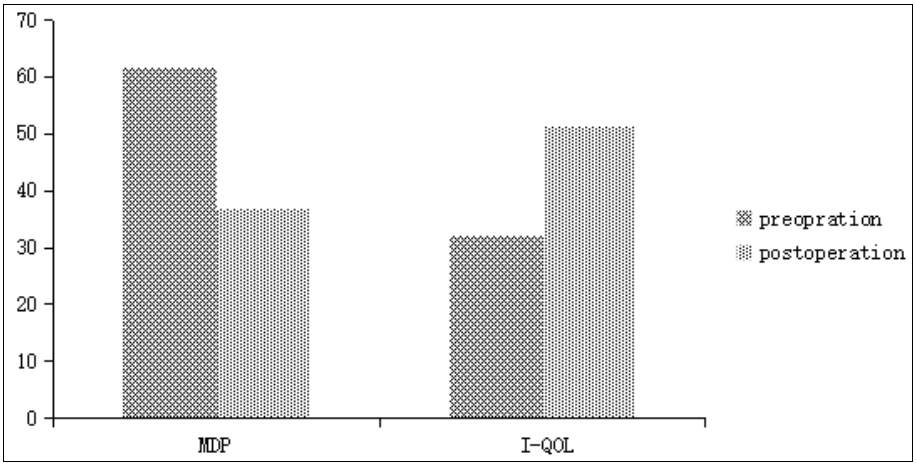


**Fig 2:** Improvement in MDP and I-QOL between preopration and postoperation

## Discussion

Botulinum toxin (BTX) is a type of neurotoxin produced by the gram-positive rod-shaped anaerobic bacterium Clostridium botulinum [14]. Intradetrusor BTX-A injection was first introduced in 2000 by Schurch *et al*. as a minimally-invasive treatment for patients with NDO [15]. In recent years, some people attempted to inject BTX-A into the detrusor muscle under cystoscopy and achieved good clinical results [16]. Baclofen inhibits spinal reflex hyperexcitability through GABA-B receptors, while BTX-A directly blocks acetylcholine release from detrusor nerve endings. Together, they inhibit bladder overactivity from different targets [17]. They had a rapid onset at 1-2 weeks and reached maximum effects usually in 6-8 weeks. According to follow-up results, patients experienced only mild hematuria, mild myastheni and urinary tract infections post-injection, with no significant post-injection discomfort or complications observed.

## Conclusions

The combined therapy of BTX-A and oral baclofen has demonstrated confirmed efficacy in treating spinal cord injury patients with NDO. However, further follow-up studies and observational research are needed to determine the long-term toxic side effects and whether the efficacy remains reliable for patients requiring repeated injections.

## Conflict of Interest Statement

The authors declare no conflict of interest.

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