

# The role of tsui scale in the treatment of primary cervical dystonia

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## ABSTRACT

**Objective:** To evaluate the severity of patients with primary cervical dystonia and the effectiveness of treatment with botulinum toxin A (Dysport) based on the Tsui scale.

**Methods:** We conducted a cross-sectional descriptive study of all patients with primary cervical dystonia treated with botulinum toxin A injections at Tam Anh General Hospital from November 2022 to April 2024. Patients were assessed in detail on the Tsui scale before and after treatment 4-6 weeks. Patients were considered to have improvement when the Tsui score after treatment decreased by at least 30% compared to before treatment.

**Results:** There were 17 patients (12 men and 5 women) who met the criteria in our study. The Tsui score before treatment in the male patient group, complex disease, with tremor was higher than that in the female patient group, simple disease, without tremor ( $p < 0.001$ ). 100% of patients responded to treatment with an average improvement rate of 0.56. The Tsui score after 4-6 weeks of injection ( $4.59 \pm 2.87$ ) improved significantly compared to before treatment ( $9.71 \pm 4.34$ ) ( $p < 0.001$ ).

**Conclusion:** Our research has demonstrated an improvement in Tsui score following treatment with BoNT among patients with primary cervical dystonia. Despite some drawbacks, the Tsui score is still a valuable tool for evaluating treatment effectiveness and can be more widely used in clinical practice.

**Keywords:** Tsui scale, Botulinum toxin A, dystonia, cervical dystonia, primary cervical dystonia.

## I. INTRODUCTION

Cervical dystonia (CD) is the most common form of focal dystonia in adults, with clinical features of involuntary muscle contractions and abnormal postures and movements of the head and neck. Currently, botulinum toxin A (BoNT) injection is considered the first choice in the treatment of all forms of CD with a

success rate of up to 70-90%.<sup>1</sup> The interpretation of treatment outcome is mainly based on the clinical experience and on the scientific value of the rating scales applied. The Tsui scale and the Toronto Western Spasmodic Torticollis Rating Scale (TWSTRS) are the two most widely used scales in clinical practice and research on CD. Each scale has its own advantages and disadvantages. In general, the Tsui scale is considered simpler and easier to apply than the TWSTRS scale.<sup>2</sup> In Vietnam, we found that researches on CD have been available since 2004, but it has been limited.<sup>3,4</sup> Furthermore, there has not been a study utilizing the Tsui scale to evaluate the characteristics and effectiveness of CD treatment. Therefore, we conducted this study to evaluate the severity of patients with primary CD and the effectiveness of treatment with BoNT (Dysport®) based on the Tsui scale at Tam Anh General Hospital in Hanoi from November 2022 to April 2024.

## II. SUBJECTS AND METHODS

### Subjects

- Inclusion criteria
- Patient over 18 years old
- Satisfy the diagnostic criteria for primary cervical dystonia of the International Parkinson and Movement Disorder Society
- Agree to participate in the study
- Exclusion criteria
- Patients with infection at the injection site
- Patients with neuromuscular junction diseases such as myasthenia gravis, myasthenic syndrome, etc.
- Insufficient information for data analysis

### Method

We conducted a cross-sectional descriptive study on all patients diagnosed with primary CD over 18 years old and treated with BoNT injection

at Tam Anh General Hospital from November 2022 to April 2024. All patients were examined and evaluated for clinical characteristics, assessing the severity of the disease before and after 4-6 weeks of treatment using the Tsui scale. The improvement rate was calculated by dividing the change of Tsui score by the baseline Tsui score before treatment. Data were analyzed using SPSS version 29.0 software.

## III. RESULTS

In total, we had 17 patients eligible for analysis of results, including 12 male patients and 5 female patients with an average age of 51.82; the oldest was 87 years old and the youngest was 17 years old. The age of onset of the disease in our study was  $46.59 \pm 18.67$ , the oldest was 85 years old and the youngest was 15 years old.

### The severity before treatment

Out of 17 cases, 5 patients had pure CD and 2 patients had combined dystonia in other areas, such as the hands and face. 10 cases were of complicated dystonia, with the most common being a combination of laterocollis and retrocollis. All patients experienced sensory tricks, meaning their abnormal posture reduced or disappeared when certain sensory stimuli, such as touching the chin, forehead, or shoulders, were applied. Additionally, the patients experienced symptoms such as tremors (41.2%), neck pain (47.1%), and neck fatigue (58.8%). The Tsui score before treatment is detailed in Table 1 below.

**Table 1.** The Tsui score before treatment

Groups		Number (n=)	Tsui score ( $\bar{X} \pm SD$ )	p
Type	Simple	7	$5.71 \pm 2.06$	< 0.001*
	Complex	10	$12.5 \pm 3.1$	

Groups		Number (n=)	Tsui score ( $\bar{X} \pm SD$ )	p
Tremor	No	10	8.10 $\pm$ 3.87	0.03*
	Yes	7	12.00 $\pm$ 4.16	
Sex	Male	12	11.42 $\pm$ 3.87	< 0.001*
	Female	5	5.60 $\pm$ 2.07	
Total		17	9.71 $\pm$ 4.34	

The Tsui score assessing the severity of patients before injection was different between groups, specifically: higher in the complex CD group compared to the simple group, in patients with tremors compared to those without tremors, and in male compared to female ( $p < 0.05$ ).

### Effectiveness after treatment

**Table 2.** Improvement of Tsui score after treatment

Patient	Tsui score (point)		
	Before treatment	After treatment 4-6 weeks	Improvement rate
1	3	1	0,67
2	16	6	0,63
3	8	2	0,75
4	8	5	0,38
5	8	3	0,63
6	6	3	0,5
7	10	5	0,5
8	7	2	0,71
9	8	4	0,5
10	13	8	0,38
11	14	6	0,57
12	4	0	1

Patient	Tsui score (point)		
	Before treatment	After treatment 4-6 weeks	Improvement rate
13	16	11	0,31
14	16	6	0,63
15	12	8	0,33
16	12	6	0,5
17	4	2	0,5
<b>Average</b>	<b>9.70</b>	<b>4.59</b>	<b>0.56</b>
<b>SD</b>	<b>4.34</b>	<b>2.87</b>	<b>0.17</b>

The Tsui scale score decreased significantly after treatment in all cases ( $p < 0.001$ ). The average improvement rate after treatment was 0.56.

## IV. DISCUSSION

### The severity before treatment

The Tsui score was first described by Tsui in the 1980s.<sup>5</sup> In this score, patients with CD are evaluated based on the degree of abnormal head posture in the horizontal (rotational), vertical (lateral) and anteroposterior planes; the duration of the abnormal posture, with or without shoulder elevation, and the degree of tremor. The highest total Tsui score is 25 points. In our study, the average pre-injection Tsui score of the patients was 9.71 (SD= 4.34). This result is lower than that in the study of Wu et al. (13.2  $\pm$  3.0) but higher than that in the study of Harald Hefter et al. (4.93  $\pm$  3.3).<sup>6,7</sup> The differences may be related to the different epidemiological characteristics, sample sizes, and the study participants. In our study, we recruit all patients satisfied the criteria of primary cervical dystonia. Meanwhile, the criteria entry into the study of Wu et al were patients with primary focal CD history no less than 6 months and Tsui score 9 or above at baseline, resulted in higher average Tsui score.<sup>6</sup>

In contrast, Harald Hefter et al only selected the patients with continuous BoNT treatment on a regular basis every 3 – 4 months at least 3 times, then the baseline Tsui score tended to be lower.<sup>7</sup> Comparing the subgroups, we found that the Tsui score was higher in men than in women, higher in the complex CD group than in the simple one. Specifically, we demonstrated that the Tsui score was also higher in the tremor group than in the non-tremor group. Tremor is not only a frequent accompanying feature in CD patients but also one of the factors that have strongly associated with response of BoNT treatment.<sup>8</sup>

### Effectiveness after treatment

In our study, the Tsui scores after 4-6 weeks in all patients were significantly improved compared to before treatment ( $p < 0.001$ ), which showed clear effectiveness of BoNT injection. The results were similar to those in previous studies.<sup>5,9</sup> In a multicenter, randomized, double-blind, placebo-controlled study by Wissel et al with a dose of 500 units of Dysport®, a significant difference in Tsui scores was also seen in 86% of patients at week 4 ( $p=0.001$ ) and week 8 ( $p=0.002$ ).<sup>9</sup> The average improvement rate after treatment in our study was 0.56. Tsui score is used to assess the effectiveness of treatment not only in short-term but also in long-term. According to Nijmeijer et al, the Tsui and subjective scores both improved after a single treatment session, and even further after one year of treatment.<sup>10</sup>

The Tsui score includes a rating for sustained movement amplitudes, duration, shoulder elevation and, in addition, for dystonic tremor. The obvious advantage of Tsui score is its simplicity so that it can be easily implemented in clinical routine. The TWSTRS allows a more sophisticated assessment of functional features of cervical dystonia, but only the Tsui score includes a rating for tremor.<sup>2</sup> However, Tsui score

has some limitations. Several features of cervical dystonia are not assessed, e.g, sensory trick, pain, disability and quality of life. The Tsui score also lacks of clear definition for the scoring “mild”, “moderate”, and “severe”. In addition, the recently proposed a new classification differentiating between head or neck subtypes.<sup>11,12</sup> Neither the Tsui score nor TWSTRS - Severity allows a differentiation between -collis and -carput types of cervical dystonia according to the 2011’s col-cap concept.<sup>2</sup> A future rating scale should be developed to consider the most current classification of CD.

### V. CONCLUSION

Our research has demonstrated an improvement in Tsui score following treatment with BoNT among patients with primary cervical dystonia. Despite some drawbacks, the Tsui score is still a valuable tool for evaluating treatment effectiveness and can be more widely used in clinical practice.

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