

# Treatment of camptocormia in patients with Parkinson's disease by injecting incobotulinumtoxin A (Xeomin®)

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## Etiology and pathogenesis of camptocormia

Camptocormia (CC) in patients with Parkinson's disease (PD) typically originates from axial segmental dystonia and/or focal paravertebral muscle myopathy; however, the exact mechanisms remain unknown. No apparent link has been observed between the severity of CC and levodopa administration regimen or daily dose.

Two hypotheses for the pathogenesis of CC have been formulated:

### Myopathic hypothesis (Wrede et al.)<sup>1</sup>

"When comparing biopsy samples of paravertebral muscles taken from camptocormia patients with autopsy samples of paraspinal muscles, as well as with the deltoid and various areas of paraspinal muscle samples against each other, similar muscle loss was observed, which suggested a common myopathic pathogenesis of camptocormia."

### Dystonic hypothesis (Jankovic)<sup>2</sup>

"...the "myopathy" severity does not correlate with the degree of camptocormia. And the Berlin team gives no explanation on why the focal myopathy occurs in connection with PD. Furthermore, the observed "neurogenic" changes reported in both groups are inconsistent with the "myopathic" theory."

"...when injected into the rectus abdominis and iliopsoas (not suprailiac), the botulinum toxin as a treatment method may at least temporarily improve the abnormal position in camptocormia patients, – this is additional evidence in support of dystonia as the main hypothesis!"



## Aims

To determine a full scale for patient assessment

To review CC treatment in PD by using botulinum neurotoxin (BoNT) injection

To test the main BoNT injection adopted regimens

To determine the most efficient CC treatment regimen

## Methods

To determine the full scale for assessment of patients with CC, we developed a 'Uniform Scale of Camptocormia' (USC), based on a modification of Nils G. Margraf's scale,<sup>3</sup> which also included an assessment of "Pisa" syndrome (Table 1)

In our study, we examined 18 patients with CC. All patients were assessed using the USC scale. The bending body angle from the vertical position ranged from 40 to 60 degrees

Computed tomography (CT) and ultrasound were used to control of the BoNT injection

- CT-based monitoring was used for BoNT injected into m. psoas major
- Ultrasound guidance was used to monitor injection into abdominal muscles

The dose of incobotulinumtoxinA injected into each muscle was maximal and was based on the recommendations set out in Wolfgang Jost's Atlas<sup>4</sup>



## Study phase 1

Our goal during the first phase of our study was to determine the most efficient BoNT injection regimen for the treatment of CC

For this purpose, 18 patients were divided into three representative groups

- In the first group (six patients), the target muscles were m. rectus abdominis (70 U on each side) and m. obliquus abdominis ext. (30 U on each side). The total amount of injected incobotulinumtoxinA was 200 U
- In the second group (six patients), the target muscles were m. obliquus abdominis int. (60 U on each side), m. obliquus abdominis ext. (60 U on each side). The total amount of injected incobotulinumtoxinA was 240 U
- In the third group (six patients) the target muscles were m. psoas major (100 U on each side) and m. obliquus abdominis int. (50 U on each side). The total amount of injected incobotulinumtoxinA was 300 U

## Study phase 1 results

Three weeks after BoNT injection, the patients were assessed using the USC.

- No effect was observed in the first group
- The second group had an insignificant and unsustainable effect (straightening of more than 20 degrees from the original body position).
- The third group reached the maximum pronounced effect according to the USC (the bending angle from the vertical body position). Two patients (33.3%) 0–5 degrees; two patients (33.3%) 10–20 degrees; and two patients (33.3%) 30 degrees. The duration of CC relief reached 5 months in four patients in this group

Therefore, the BoNT injection regimen used in the third group, which included m. psoas major and m. obliquus abdominis int., proved to be the most efficient

In the course of assessing the study outcomes, a clinical picture of the symptoms in patients with a bending angle of 20–30 degrees was evaluated

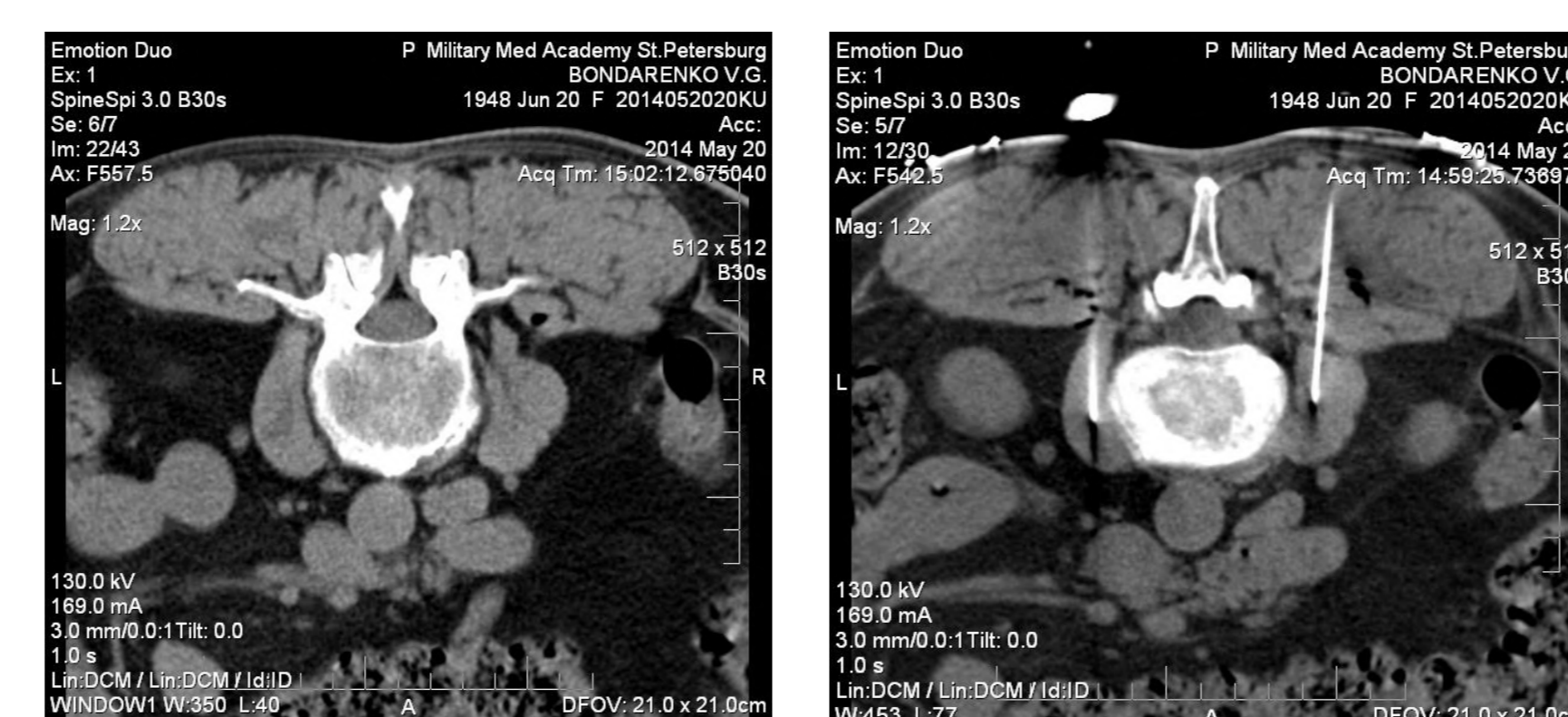
It was found that these patients could keep their vertical body position for a while, when they stood or sat still.

- These patients further reported that prior to BoNT injection they had an urge to bend forward, but after BoNT injection they felt they did not have the strength to hold their body in a vertical position for long time, and that it bent under its own weight.

We assumed that this was because of a lack of power in the extensor muscles of the back, due to the development of secondary myopathy as a reaction to the long-term overstretching of the muscles

To correct secondary myopathy, we decided to use physiotherapy, massage, and electrical stimulation to the back muscles

To evaluate the efficacy of this treatment, we initiated the second phase of the study



## References

1. Wrede et al. Acta Neuropathol. 2012; 123: 419–432.
2. Jankovic J. Mov Disord 2010; 25: 527–528.
3. Margraf NG et al. Mov Disord 2010; 25: 542–551.
4. Jost W. Pictorial Atlas of Botulinum Toxin Injection. Quintessence Publishing Co Ltd; 1 edition (30 Aug. 2008). New Malden, UK.

## Study phase 2

We initiated the second phase of the study when the treatment effect of the previous BoNT injection ended and symptoms of CC returned. All 18 patients were assessed with the USC scale. The bending body angle from the vertical position ranged from 40 to 60 degrees

Eighteen patients received injections of incobotulinumtoxinA into m. psoas major (125 U on each side) and m. obliquus abdominis int. (50 U on each side). The total amount of injected incobotulinumtoxinA was 350 U

Post-injection, patients were divided into two representative groups comprising nine patients each. The first group had physiotherapy sessions but the second group did not

## Study phase 2 results

An assessment was performed at 3 weeks, and at 4,5 and 6 months after the BoNT injection.

According to the USC (the bending angle from a vertical body position), the effect in the first group (nine patients) lasted for 5–6 months and:

- five patients (56%) reached a vertical body position
- three patients (33%) reached 10 degrees
- one patient (11%) reached 20 degrees

The effect in the second group (nine patients) according to the USC (the bending angle from a vertical body position) lasted 4–5 months and was as follows:

- three (33%) patients reached 0–5 degrees
- five (56%) patients reached 10–20 degrees
- one (11%) patient reported no effect

Therefore, the use of physiotherapy, massage, and electrical stimulation of the back muscles was effective.



## Conclusions

The dose of 350 U of incobotulinumtoxinA injected into m. psoas major and m. obliquus abdominis internus was an effective therapy for treating CC in PD. Physiotherapy, massage, and electrical stimulation increased the efficacy and duration of BoNT therapy.

Table 1. Uniform Scale of Camptocormia (USC)

| 1. Bending degree (in degrees from the vertical position):        |                                     |  |  |       |
|---|-------------------------------------|--|--|-------|
| No bending  | 0–29                                | 30–59  | 60–89  | ≥90   |
| 0   | 1                                   | 2  | 3  | 4     |
| 2. Dependence of the CC onset on the body position:               |                                     |  |  |       |
| 4   | 3                                   | 2  | 1  |       |
| is manifested in the sitting position                             | occurs immediately after getting up | occurs after walking a distance of about 50 meters             | occurs only after spending too much time standing or walking |       |
| If CC occurs during walking (at what step or in how many meters)? |                                     |  |  |       |
| 4. Form of CC:  |                                     |  |  |       |
| Thoracolumbar   |                                     | Sacrolumbar  |  |       |
| 5. Type of CC:  |                                     |  |  |       |
| Isolated  |                                     | Combined with anterocollis                                     | Combined with Pisa syndrome                                  |       |
| Angle side:   |                                     | "Pisa" bending degree (in degrees from the vertical position): |  |       |
| Left  | Right                               | 0–15   | 15–30  | 30–45 |
| 6. How often is CC manifested during the day?                     |                                     |  |  |       |
| 4   | 3                                   | 2  | 1  |       |
| Throughout the day  | For several hours a day             | In the evening only/after considerable loads                   | Occurs occasionally  |       |
| 7. Do you have back pain?   |                                     |  |  |       |
| 1   | 2                                   | 3  | 4  | 5     |
| 6   | 7                                   | 8  | 9  | 10    |
| Where 0 = no pain and 10 = most severe pain                       |                                     |  |  |       |
| 8. To what extent is CC limiting your daily activities?           |                                     |  |  |       |
| 1   | 2                                   | 3  | 4  | 5     |
| 6   | 7                                   | 8  | 9  | 10    |
| Where 0 = not limiting and 10 = very limiting                     |                                     |  |  |       |
| 9. How long ago did you developed CC?                             |                                     |  |  |       |
| 10. Does the degree of CC grow over time?                         |                                     |  |  |       |
| 11. Do you use walking aids while walking?                        |                                     |  |  |       |

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