**Supplemental material**

**Botulinum toxin type A injections as monotherapy for upper limb essential tremor using kinematics**

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**Supplemental Figure 1**



**Supplemental Figure 1 Caption:**

Number of ET participants who scored ≤3 on the MMT scale for finger flexion, finger extension, finger abduction, finger adduction, wrist flexion and wrist extension weakness.

**Supplemental Figure 2**

**Supplemental Figure 2 Caption:**

Number of ET participants who scored ≥3 on the MMT scale for finger flexion, finger extension, finger abduction, finger adduction, wrist flexion and wrist extension weakness are plotted on the primary axis and the mean Likert score for perceivable weakness reported by participants is plotted on the secondary axis.

**Supplemental Table 1**

|  |  |  |  |
| --- | --- | --- | --- |
|   | **First injection (Week 0)** | **Second injection (Week 16)** | **Third injection (Week 32)** |
| **Participant ID** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **Mean** | **SD** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **Mean** | **SD** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **Mean** | **SD** |
| **Flexor carpi radialis** | 10 | 10 | 30 | 10 | 15 | 15 | 15 | 15 |  | 15 | 15.0 | 6.1 | 10 | 5 | 10 | 10 | 15 | 15 | 15 | 20 |  | 25 | 13.9 | 6.0 | 10 | 5 | 10 | 5 | 10 | 15 | 15 | 10 |  | 20 | 11.1 | 4.9 |
| **Flexor carpi ulnaris** | 10 | 10 |  | 10 | 15 | 15 | 15 | 15 |  | 15 | 13.1 | 2.6 | 10 | 5 | 10 | 10 | 15 | 15 | 15 | 20 |  | 25 | 13.9 | 6.0 | 10 | 5 | 10 | 5 | 15 | 15 | 15 | 10 |  | 20 | 11.7 | 5.0 |
| **Brachioradialis** |   |  |  |  |  |  |  | 20 |  |  | 20.0 | 0.0 |   |  |  |  |  |  |  | 25 |  |  | 25.0 | 0.0 |  |  |  |  |  |  |  | 20 |  |  | 20.0 | 0.0 |
| **Extensor carpi radialis** | 25 | 25 | 10 | 15 | 15 | 15 | 15 | 20 | 10 | 15 | 16.5 | 5.3 | 20 | 15 |  | 15 | 15 | 15 | 15 | 30 | 15 | 25 | 18.3 | 5.6 | 20 | 15 |  | 5 | 15 | 15 | 15 | 30 | 15 | 15 | 16.1 | 6.5 |
| **Extensor carpi ulnaris** | 25 | 25 |  | 15 | 15 | 15 | 15 | 20 | 10 | 15 | 17.2 | 5.1 | 20 | 15 |  | 15 | 15 | 15 | 15 | 30 | 15 | 25 | 18.3 | 5.6 | 20 | 15 |  | 5 | 20 | 15 | 15 | 30 | 15 | 15 | 16.7 | 6.6 |
| **Pronator teres** | 15 | 10 | 25 |  | 10 | 15 | 20 | 15 | 15 |  | 15.6 | 5.0 | 15 | 5 | 20 |  | 10 | 15 | 20 | 20 | 20 | 20 | 16.1 | 5.5 | 15 | 5 | 20 | 5 | 15 | 15 | 20 | 15 | 20 | 30 | 16.0 | 7.4 |
| **Pronator quadratus** | 15 | 10 | 25 |  | 10 | 15 | 20 | 15 | 15 |  | 15.6 | 5.0 | 15 | 5 | 20 |  | 10 | 15 | 20 | 20 | 20 | 20 | 16.1 | 5.5 | 15 | 5 | 20 | 5 | 15 | 15 | 20 | 15 | 20 | 30 | 16.0 | 7.4 |
| **Supinator**  |   | 10 | 10 |  |  | 15 | 20 | 15 | 15 |  | 14.2 | 3.8 | 20 | 10 | 10 |  |  | 15 | 20 | 15 | 20 | 20 | 16.3 | 4.4 | 20 | 10 | 10 | 5 | 10 | 15 | 20 | 15 | 20 | 30 | 15.5 | 7.2 |
| **Biceps brachii** | 30 | 25 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 20 | 28.5 | 3.4 | 40 | 10 | 20 | 30 | 30 | 30 | 30 | 30 | 40 | 30 | 29.0 | 8.8 | 40 | 10 | 20 | 25 | 30 | 30 | 30 | 20 | 40 | 40 | 28.5 | 10.0 |
| **Triceps** | 30 | 25 | 30 | 30 | 30 | 30 | 30 | 30 |  | 20 | 28.3 | 3.5 | 40 | 10 | 20 | 30 | 30 | 30 | 30 | 30 |  | 30 | 27.8 | 8.3 | 40 | 10 | 20 | 25 | 30 | 30 | 30 | 30 |  | 40 | 28.3 | 9.4 |
| **Pectoralis major** |   | 25 | 20 | 25 | 30 | 20 |  | 20 |  | 25 | 23.6 | 3.8 | 25 | 10 | 20 | 25 | 30 | 20 |  | 30 |  | 30 | 23.8 | 6.9 | 25 | 10 | 20 | 30 | 25 | 20 |  | 30 |  | 30 | 23.8 | 6.9 |
| **Teres major** |   | 25 |  | 15 | 30 | 15 |  | 20 |  | 25 | 21.7 | 6.1 | 25 | 10 |  | 15 | 30 | 15 |  | 30 |  | 30 | 22.1 | 8.6 | 25 | 10 |  | 25 | 25 | 15 |  | 30 |  | 30 | 22.9 | 7.6 |
| **Deltoid** |   |  |  | 20 |  |  |  |  |  | 25 | 22.5 | 3.5 | 25 |  |  | 20 |  |  |  |  |  |  | 22.5 | 3.5 | 25 |  |  | 30 | 25 |  |  |  |  |  | 26.7 | 2.9 |
| **Supraspinatus** |   |  | 20 | 15 |  |  |  |  |  | 25 | 20.0 | 5.0 | 25 |  | 20 | 15 |  |  |  |  |  |  | 20.0 | 5.0 | 25 |  | 20 | 30 | 25 |  |  |  |  |  | 25.0 | 4.1 |

|  |  |  |  |
| --- | --- | --- | --- |
|   | **Fourth injection (Week 48)** | **Fifth injection (Week 64)** | **Sixth injection (Week 80)** |
| **Participant ID** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **Mean** | **SD** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **Mean** | **SD** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **Mean** | **SD** |
| **Flexor carpi radialis** | 10 | 5 | 10 | 5 | 10 | 15 | 10 | 15 |  | 20 | 11.1 | 4.9 | 10 | 5 | 10 | 5 | 10 | 15 | 10 | 10 |  | 20 | 10.6 | 4.6 | 10 | 5 | 10 | NO INJECTION | 10 | 15 | 5 | 5 |  | 15 | 9.4 | 4.2 |
| **Flexor carpi ulnaris** | 10 | 5 | 10 | 5 | 15 | 15 | 10 | 15 |  | 20 | 11.7 | 5.0 | 10 | 5 |  | 5 | 15 | 15 | 10 | 10 |  | 20 | 11.3 | 5.2 | 10 |  |  | 15 | 15 | 5 | 5 |  | 15 | 10.8 | 4.9 |
| **Brachioradialis** |   |  |  |  |  |  |  | 20 |  |  | 20.0 | 0.0 |   |  |  |  |  |  |  | 20 |  |  | 20.0 | 0.0 |  |  |  |  |  |  | 20 |  |  | 20.0 | 0.0 |
| **Extensor carpi radialis** | 20 | 15 |  | 5 | 15 | 15 | 10 | 30 | 15 | 15 | 15.6 | 6.8 | 20 | 5 | 10 | 5 | 15 | 15 | 10 | 15 | 15 | 15 | 12.5 | 4.9 | 20 |  | 10 | 15 | 15 | 5 | 15 | 15 | 15 | 13.8 | 4.4 |
| **Extensor carpi ulnaris** | 20 | 15 |  | 5 | 20 | 15 | 10 | 30 | 15 | 15 | 16.1 | 7.0 | 20 | 5 |  | 5 | 20 | 15 | 10 | 15 | 15 | 15 | 13.3 | 5.6 | 20 | 5 |  | 20 | 15 | 5 | 15 | 15 | 15 | 13.8 | 5.8 |
| **Pronator teres** | 15 | 5 | 20 | 5 | 15 | 15 | 15 | 20 | 20 | 30 | 16.0 | 7.4 | 15 | 5 | 20 | 5 | 15 | 15 | 15 | 10 | 20 | 30 | 15.0 | 7.5 | 15 | 5 | 20 | 15 | 15 | 10 | 10 | 20 | 30 | 15.6 | 7.3 |
| **Pronator quadratus** | 15 | 5 | 20 | 5 | 15 | 15 | 15 | 20 | 20 | 30 | 16.0 | 7.4 | 15 | 5 | 20 | 5 | 15 | 15 | 15 | 10 | 20 | 30 | 15.0 | 7.5 | 15 | 5 | 20 | 15 | 15 | 10 | 10 | 20 | 30 | 15.6 | 7.3 |
| **Supinator**  | 20 | 10 | 10 | 5 | 10 | 15 | 15 | 15 | 20 | 30 | 15.0 | 7.1 | 20 | 10 | 10 | 5 | 10 | 15 | 15 | 15 | 20 | 30 | 15.0 | 7.1 | 20 | 10 | 10 | 10 | 15 | 10 | 15 | 20 | 30 | 15.6 | 6.8 |
| **Biceps brachii** | 40 | 10 | 20 | 35 | 40 | 30 | 30 | 20 | 40 | 40 | 30.5 | 10.7 | 40 | 10 | 20 | 35 | 40 | 30 | 30 | 20 | 40 | 40 | 30.5 | 10.7 | 40 | 10 | 20 | 40 | 15 | 25 | 15 | 40 | 35 | 26.7 | 12.2 |
| **Triceps** | 40 | 10 | 20 | 35 | 40 | 30 | 30 | 30 |  | 40 | 30.6 | 10.1 | 40 | 10 | 20 | 35 | 40 | 30 | 30 | 30 |  | 40 | 30.6 | 10.1 | 25 | 10 |  | 25 | 15 | 10 | 40 |  | 30 | 22.1 | 11.1 |
| **Pectoralis major** | 25 | 10 | 20 | 40 | 25 | 20 |  | 30 |  | 30 | 25.0 | 8.9 | 25 | 10 | 20 | 40 | 25 | 20 |  | 40 |  | 30 | 26.3 | 10.3 | 40 | 10 | 20 | 40 | 30 | 25 | 25 |  | 35 | 28.1 | 10.3 |
| **Teres major** | 25 | 10 |  | 30 | 25 | 15 |  | 30 |  | 30 | 23.6 | 8.0 | 25 | 10 |  | 30 | 25 | 15 |  | 40 |  | 30 | 25.0 | 10.0 | 25 | 10 | 20 | 25 | 20 | 30 | 40 |  | 30 | 25.0 | 8.9 |
| **Deltoid** | 25 |  |  | 40 | 25 |  |  |  |  |  | 30.0 | 8.7 | 25 |  |  | 40 | 25 |  |  | 30 |  |  | 30.0 | 7.1 | 25 |  |  | 25 |  | 10 | 30 |  |  | 22.5 | 8.7 |
| **Supraspinatus** | 25 |  | 20 | 40 | 25 |  |  |  |  |  | 27.5 | 8.7 | 25 |  | 20 | 40 | 25 |  |  | 30 |  |  | 28.0 | 7.6 | 25 |  | 20 | 25 |  | 10 | 30 |  |  | 22.0 | 7.6 |

**Supplemental Table 1 caption:**

Summary table of the BoNT-A dosages injected for each muscle per participant and the average dose per muscle for each injection cycle.

**Supplemental Table 2**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Mean**  | **SD** | **Range (low)** | **Range (high)** |
| **Flexor carpi radialis** | 11.9 | 5.3 | 5 | 30 |
| **Flexor carpi ulnaris** | 12.1 | 4.8 | 5 | 20 |
| **Brachioradialis** | 20.8 | 2.0 | 20 | 25 |
| **Extensor carpi radialis** | 15.5 | 5.7 | 5 | 30 |
| **Extensor carpi ulnaris** | 15.9 | 6.0 | 5 | 30 |
| **Pronator teres** | 15.7 | 6.5 | 5 | 30 |
| **Pronator quadratus** | 15.7 | 6.5 | 5 | 30 |
| **Supinator**  | 15.3 | 6.2 | 5 | 30 |
| **Biceps brachii** | 29.0 | 9.3 | 10 | 40 |
| **Triceps** | 28.2 | 9.0 | 10 | 40 |
| **Pectoralis major** | 25.1 | 8.0 | 10 | 40 |
| **Teres major** | 23.5 | 7.9 | 10 | 40 |
| **Deltoid** | 26.1 | 6.8 | 10 | 40 |
| **Supraspinatus** | 24.2 | 6.9 | 10 | 40 |

**Supplemental Table 2 caption:**

Summary table of the mean number and range (lowest and highest) of BoNT-A units injected across all six treatments for all participants for each muscle.