Objective Measure of the Functional Outcomes after Botulinum Toxin Injection for Adult Neurological Patients

Lao LM(1), Chan NC(1), Law HY (2), Wong YP (2), Yeung KT(2), Yam KY(2), Poon YHP (1)

(1)Department of Physiotherapy, Tuen Mun Hospital (2)Department of Neurosurgery, Tuen Mun Hospital

Keywords:
spasticity management
stroke
oxygen consumption

Introduction
Patients with stroke have encountered different forms of physical disability due to spasticity. Botulinum Toxin has been used in treating spasticity for patients with stroke in the past decade. Many studies showed its effectiveness in improving muscle tone and range of motion in upper and lower limbs. The functional outcome like walking efficiency was rarely reviewed. Energy expenditure in terms of oxygen consumption has been proven to be a reliable and objective measure to document the walking efficiency of patients with movement disability.

Objectives
This study is to review the use of oxygen consumption test in documenting the walking efficiency for patients with stroke undergone spasticity management with Botulinum Toxin injection.

Methodology
Patients with stroke with increased lower limbs spasticity (MAS ≥ 2) were recruited. All of them should be able to walk independently for at least 10 minutes without orthoses and walking aids. Patients were assessed by doctors and physiotherapists in the Botox Clinics to decide the muscle groups for Botulinum Toxin injection. Oxygen consumption was measured using a portable gas analyzer (K4b2, COSMED srl., Italy) at pre-, 1-month and 3-month post- injection. During the test, patients were asked to walk for 10 minutes at their natural speed through a specified walkway and the oxygen uptake was measured with the portable analyzer. Data was analyzed using statistical test of repeated measures ANOVA.
**Result**

Results: Thirty subjects were recruited in this study with mean age of $41.6 \pm 12.1$ years old. All of them showed improvement in oxygen consumption after Botulinum Toxin treatment. The mean oxygen uptake during walking decreased from pre-injection $0.673 \pm 0.492$ ml/kg/m to 1-month post-injection $0.588 \pm 0.364$ ml/kg/m, and 3-month post-injection $0.532 \pm 0.347$ ml/kg/m, with statistically significant improvement ($p=0.002$). Moreover, subjective feeling of patients also indicated ease of walking after the treatment. Conclusions: The oxygen consumption could objectively and accurately reflect the change in the functional outcome of Botulinum Toxin treatment in adults with post-stroke lower limbs spasticity. The oxygen consumption of adults with post-stroke lower limbs spasticity was much decreased after Botulinum Toxin treatment which indicated that the adults could walk in a more effective way after the injection.