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The Use of Oxygen Consumption Test as an Objective Measure of the Walking Efficiency for Patient with Stroke after Botulinum Toxin Injection

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Introduction

Patients with stroke have encountered different forms of physical disability due to spasticity. Botulinum Toxin (BT) has been used in treating spasticity for patient with stroke in the past decade. Many studies showed its effectiveness in improving the tone and range of motion in upper and lower limbs. The functional outcome like the walking efficiency was rarely reviewed. Energy expenditure in term of oxygen consumption has been proven to be a reliable measure to document the walking efficiency of patient 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. Patient were selected for BT injection to lower limbs by the doctors. Oxygen consumption was measured using a portable gas analyzer (K4b2, COSMED srl., Italy) at pre, 1 month and 3 months 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 machine. Data was analyzed using statistical test of repeated measured ANOVA.

Result

Results: Ten subjects were recruited in this study with mean age 41.9 ± 14.0 years old. All of them showed improvement in oxygen consumption after Botulinum Toxin treatment. The mean oxygen used during walking decreased from pre-injection 0.760 0.570 ml/kg/m to 1 month post-injection 0.653 0.399 ml/kg/m, and 3 months

post-injection 0.573 ± 0.379 ml/kg/m, with statistically significant difference ($p=0.031$). 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.