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The Use of Gait and Motion Analysis for Patients with Neurosurgical Conditions

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cerebral palsy

stroke

spina bifida

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hydrocephalus

Introduction

Introduction: Patients suffered from neurological diseases will lead to different forms of motion and balance problems. The test in the gait and motion analysis laboratory could provide an objective measure especially for the neurosurgical patients.

Assessment on pre- and post-surgery could be done to document the changes. In western countries, gait and motion analysis has been used extensively to document the motion deficit of patients mainly with cerebral palsy. However, the application of gait and motion analysis for other diseases groups was rarely reviewed.

Objectives

Objective: The aim of the present work is to review the use of gait and motion analysis for patients with different neurosurgical conditions and for further enhancement of the service.

Methodology

Methodology: Gait and motion analysis included assessments of (1) 3D kinematics and kinetics measures of upper and lower limbs which gave joint angles and load, (2) Quantitative analysis of EMG which discerned whether the muscles were contracting in a concerted manner, (3) Balance test on force platform which detected changes of postural sway by calculating the displacements of centre of pressure, (4) Dynamic pedography which measured plantar pressure of foot during walking, (5) Oxygen consumption test which provided an estimate of overall energy expenditure during walking, (6) Video recording which provided qualitative documentation, and (7) Physical examination by physiotherapist which provided detailed information of patients' conditions. Patients referred for gait and motion analysis were assessed by either one or some of the tests. Their reasons or diagnosis of the referrals were reviewed retrospectively. The application of the test in gait and motion laboratory to the specific neurosurgical condition was also reviewed.

Result

Results: Patients with gait and motion analysis done from February 2009 to December 2015 were reviewed. Three hundreds and forty-seven neurosurgical cases received the tests during that period. In which, 56% of them were patients with cerebral palsy and 28% belonged to stroke condition, both conditions were referred for documenting the changes of gait before and after spasticity management; 7% were patients with spina bifida and 4% were patients with epilepsy, both groups were referred for documenting the changes pre- and post-surgical recession of the lesions; 3% were patients with hydrocephalus in which balance in walking and standing were tested by the use of force platform, changes could be clearly illustrated after surgical interventions. The remaining 2% were patients suffered from head injury and brain tumor, this group of patients were referred for documenting the changes of gait over time with management. The use of gait laboratory to document the changes of movement is helpful for both the patients and the doctors to have a clear picture of their conditions before and after intervention. **Conclusions:** It was believed that gait and motion analysis was useful for patients with not only cerebral palsy but also other neurosurgical diseases which were reflected by the increasing number of referrals. Gait and motion analysis could provide information for the medical and surgical teams in formulating a better treatment option. More outcome measures should be adopted to serve as indicators for further improvement.