



Original Article

Which is better in the rehabilitation of stroke patients, core stability exercises or conventional exercises?

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Abstract. [Purpose] The aim of this study was to determine which is better in the rehabilitation of stroke patients, core stability exercises or conventional exercises. [Subjects and Methods] Forty participants with hemiplegia were recruited in the Department of Neurology of Yidu Central Hospital of Weifang between January 2014 and February 2015 and randomly divided into either an experimental or control group. The patients in the control group performed conventional exercises for six weeks, and those in the experiment group performed core stability exercises for six weeks. The outcomes were evaluated using Modified Barthel Index and Berg Balance Scale. [Results] After treatment, the Modified Barthel Index and Berg Balance Scale were significantly increased in both groups when compared with the baseline. The Modified Barthel Index was significantly lower in the control group compared with the experimental group. The Berg Balance Scale scores in the control group were relatively lower than those in the experimental group, but there was no significant difference between the two groups. [Conclusion] Core stability exercises have a better effect on patients with hemiplegia than conventional exercises.

Key words: Core stability exercises, Conventional exercises, Hemiplegia

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INTRODUCTION

Stroke, with a high prevalence and long-term disabilities, is a major health problem in the world^{1,2)}, and it was reported that about two million people suffer from stroke each year³⁾. Impairments including loss of strength, sensation, and coordination abilities, which result in walking difficulties, balance disorders, and limb function disturbance, occur in 70–80% of stroke patients⁴⁾. This affects the life quality of patients adversely and leads to a heavy economic burden on society. Subsequently, effective rehabilitation interventions to optimize recovery in stroke patients have received high attention.

In the treatment of balance and gait dysfunction, exercise therapy is regarded as one of the commonly used methods that bring greater benefits in physical function for stroke patients⁵⁾. The effect of exercises on balance and gait dysfunction in stroke patients has been confirmed by many clinical studies^{3,6,7)}. In addition, core stability exercises have been widely carried out in many fields, including medical rehabilitation, sports training, and medical care. Core stability exercises were shown to improve dynamic standing balance, functional autonomy, static balance, flexibility, and stability⁸⁾.

In recent years, core stability exercises have been reported to improve the rehabilitation effect in stroke patients. In a study of 20 stroke patients, the control group underwent standard exercise therapy, while the experiment group underwent both the core stability-enhancing exercise and standard exercise therapy simultaneously. After 4 weeks, Yu found that the mean trunk impairment scale score and muscle activity of the lower trunk increased in the experiment group significantly⁹⁾. In study by

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Cabanas-Valdes, 80 patients were randomly assigned to an experimental group and a control group, both groups underwent conventional therapy including exercises, and the experimental group performed core stability exercises. The results showed that core stability exercises improve the efficacy of conventional exercises¹⁰. Although these studies confirmed the effect of core stability exercises in the rehabilitation of stroke patients, few comparative studies have been carried out to compare the effect of core stability exercises and conventional exercises. Which is better in improving the stability and balance of stroke patients, core stability or conventional exercises? The answer is still unclear.

Therefore, a prospective study including 40 participants was carried out in the Department of Neurology of Yidu Central Hospital of Weifang between January 2014 and February 2015. The objective of the study was to determine which is better in the rehabilitation of stroke patients, core stability exercises or conventional exercises.

SUBJECTS AND METHODS

Participants with stroke-induced hemiplegia were recruited from the Department of Neurology of Yidu Central Hospital of Weifang between January 2014 and February 2015. The diagnosis and lesion side of these participants were confirmed by history evaluation, physical examination, brain imaging, and examination of their medical records. The inclusion criteria⁹ were ability to walk more than 32 feet, duration of disorder >6 months, no musculoskeletal problems, absence of any cardiac disorders, complete understanding of this research, and ability to communicate. The included participants were randomly divided into either an experimental or control group by a random computer-generated sequence. The randomization was managed by a physician who was not involved in the study. The group allocations were concealed in numbered, sealed, opaque envelopes¹⁰. All the included patients signed an informed consent form, and the study was approved by the ethics committee of our hospital.

The patients in the control group performed conventional exercises including limb stretching, passive mobilization of joints, walking between parallel bars, and occupational therapy¹¹. The patients in the experiment group performed core stability exercises including the plank, side plank, bridge, straight leg raise, and modified push-up¹². Before the beginning of the study, the patients were given individual instruction by the researchers. During the exercises, physicians provide necessary assistance to help the patients in executing the exercises. The exercises in both groups were performed for one hour per day, six times a week for six weeks.

The Modified Barthel Index (MBI)¹³ and Berg Balance Scale (BBS)¹³ were used to assess the clinical outcomes of the two groups. The MBI, which demonstrates the ability of patients to deal with daily activities, consists of ten items including personal hygiene, taking a bath alone, eating, using the bathroom, ascending stairs, dressing, defecating, controlling urine, walking or using a wheelchair, and moving to a chair or bed. Each item is rated on a scale of 5 ranging from independent conduct to impossible to conduct. The BBS, which can evaluate static and dynamic balance abilities of patients, consists of 14 items covering functional tasks in three domains, sitting, standing, and changing posture, that are scored on a scale of 0–4.

IBM SPSS STATISTICS 21.0 (IBM Corp., Armonk, NY, USA) was used for statistical analysis, and $p < 0.05$ was considered significant. The differences in the baseline data including age, gender, and disease course were compared using the t test or χ^2 test. Comparison for the MBI and BBS were carried out using the t test.

RESULTS

In the current study, 40 patients with stroke-induced hemiplegia were included and divided randomly into experimental and control groups, with 20 participants in each group at the beginning of the study. The baseline clinical data including age, gender, disease course, BBS, and MBI were recorded. There was no significant difference in baseline data between the two groups ($p > 0.05$). The patients in the control group performed conventional exercises for six weeks and those in the experimental group carried out core stability exercises for six weeks.

Three patients in the experimental group and two in the control group withdrew from the study two weeks after treatment, and in total thirty-five patients completed the training. The final results showed that, compared with the baseline, the mean MBI scores of the experimental and control groups increased significantly from 53.5 and 55.1 to 66.8 and 61.2 ($p < 0.05$), respectively, and that the mean BBS scores increased significantly from 30.2 and 31.9 to 38.6 and 35.7 ($p < 0.05$), respectively. In addition, MBI scores were significantly lower ($p < 0.05$) in the control group than in the experimental group. The BBS scores in the control group were relatively lower than those in the experimental group, but there was no significant difference between the two groups ($p > 0.05$).

DISCUSSION

A prospective study was carried out to compare the effect of core stability exercises and conventional exercises on patients with stroke-induced hemiplegia. To the best of our knowledge, few studies have been published on this topic in the English literature.

The core is central to almost all kinetic chains in the human body¹⁰. The core, described as a box in the trunk with the abdominals, paraspinals, and gluteals; diaphragm and pelvic floor; and hip girdle musculature serving as the front wall, back

wall, roof, and bottom, respectively, makes up the largest part of the body and plays an important role in stabilizing the body and controlling movement of daily activities⁹⁾. Core stability is regarded as a prerequisite for maintaining proper posture of the lumbar and pelvic regions during sports activities⁹⁾. As a result, core stability exercises have many advantages in the field of rehabilitation and can improve the activation and cooperative contractions of abdominal and multifidus muscles, facilitating the function and movement of the limbs^{9, 12)}.

In the current study, the MBI and BBS scores after treatment were significantly increased in both the experimental and control groups when compared with those before treatment. This indicates that both core stability exercises and conventional exercises can improve the abilities of patients to deal with daily activities and control body balance, which confirms the viewpoints of many published studies^{9, 10)}.

In addition, after treatment, the MBI scores were significantly lower in the control group than those in the experimental group, and the BBS scores in the control group were also lower than those in the experimental group. The outcomes demonstrate that compared with conventional exercises, core stability exercises can result in better effectiveness in patients with stroke-induced hemiplegia. However, in terms of comparison of the BBS scores at the end of treatment, although the mean BBS score in the experimental group was larger than that in the control group, there was no significant difference between the two groups. Such a condition may be attributed to the relatively small sample size, and in a larger-scale study, the difference between the two groups may be significant. Consequently, the outcomes in the present study can demonstrate that core stability exercises present with better effectiveness than conventional exercises.

This study has some limitations. First, the sample size was small, and a large-scale clinical study may be better in a comparative study. Second, the exercises results were evaluated using self-reported measures of function instead of an objective measurement, and this may have had some adverse influence on the final outcomes. Third, there was a lack of long-term follow-up in the study, and it is unclear whether the effectiveness of core stability exercises will decrease in patients with hemiplegia with time. Therefore, more studies need to be carried out in the future.

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