
COMPARING THE RESULTS OF SPINAL REHABILITATION BY THE CS-A15 EXERCISE PROGRAM WITH MC KENZIE EXERCISES IN PATIENTS WITH LUMBAR DISC HERNIATION

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ABSTRACT

Purpose: We aimed to compare the spinal rehabilitation results of the CS-A15 exercise program with the Mc Kenzie exercises in patients with lumbar disc herniation.

Methods: Prospective interventional study, type of controlled clinical trial.

Results: After two weeks of treatment: Pain reduction according to VAS scale, Lasègue angle score, Schober index and the Oswestry disability index (ODI) in the study group and control group all improved significantly compared to before treatment, different from $p < 0.001$. As for the ODI, the patients in the study group had a better improvement than the control group, the difference was statistically significant with $p < 0.05$.

- After one month of treatment: Both the CS-A15 exercise program group and the Mc Kenzie exercises group reduced pain, reduced nerve root tension, improved spinal range of motion and the ODI, significantly different from before treatment, with $p < 0.0001$. Particularly in terms of pain relief, nerve root tension and the ODI, the patients in the study group had a better improvement than the control group patients, the difference was statistically significant with $p < 0.05$.

Keywords: Lumbar disc herniation, CS-A15 exercise, rehabilitation.

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1. INTRODUCTIONS

The herniated disc is a condition in which the nucleus pulposus of the spinal disc breaks out of its normal position in the annulus, compressing the spinal canal or nerve roots, leading to a mechanical inflammatory response. The cause of disc herniation can be due to disc degeneration and the force of trauma to the spine. Currently, there is 85- 90% of herniated disc cases are treated with conservative methods. JamesABerry et al. (2019) synthesized the treatment methods of the American Neurological Association and made treatment recommendations: The first choice is education to prevent prevent herniated discs, spinal exercises and spinal manipulation, physical therapy (such as thermal therapy, electrical pulses - TENS currents, therapeutic ultrasound and neuroelectrical stimulation); pain control with non-steroidal anti-inflammatory

drugs, if the pain is severe, epidural injection or injection through the intervertebral foreman [3].

The correct method of spinal movement exercises will help relax muscles, reduce disc pressure, increase disc nutrition, reduce pain, restore spinal function, increase the strength of spinal muscles and increase the firmness of the ligaments. Thereby, it helps to reduce the risk of disc degeneration, spondylolisthesis and recurrent spinal disc herniation [4], [8]. In the world, there are some exercises for patients with low back pain and herniated disc such as Mc Kenzie exercises, Sinfield exercises, and Mc Gill exercises, etc. Mc Kenzie exercises are recommended by the American Neurological Association as a guide and distribute leaflets for patients with herniated discs to practice at home when they are in the subacute and chronic stages. In clinical practice at the hospital, this

exercises are not suitable for each pain stage of herniated disc patients.

In 2020, the Rehabilitation Department of Military Medical University has developed a CS-A15 exercise program with 15 exercises, divided into three stages of herniated disc disease. The exercises were evaluated to have the effect reduce disc pressure, reduce pain and restore spinal function [2].

Moreover, this exercise is suitable for all patients, applied from acute pain to recovery; the exercise process is evaluated and advised for each exercise according to different levels of disease. To evaluate the effectiveness of the CS-A15 exercise program better, we conducted this study intending to compare the spinal rehabilitation results of the CS-A15 exercise program with the Mc Kenzie exercises in patients with lumbar disc herniation.

2. SUBJECTS AND METHODS

2.1. Subjects

- Including 96 patients were diagnosed with lumbar disc herniation and were treated at the Neurology Department, Rehabilitation Department of 103 Military Hospital from October 2021 to September 2022.

- Exclusion criteria: Lumbar disc herniation patients had indication for surgery (patients with cauda equina syndrome, muscle atrophy, weakness or paralysis of one leg muscle, grade II spondylolisthesis...); patients are accompanied by other diseases such as inflammatory spine disease (ankylosing spondylitis), cancer metastasis, spinal tuberculosis and inflammation caused by infection...; Patients did not agree to participate in the study or did not comply with the principles of treatment.

2.2. Methods

- Study design: prospective interventional study, type of controlled clinical trial.

- Diagnosis of herniated disc:

+ About clinical: The patient has 4/6 criteria of Saporta (1970).

+ About subclinical: Magnetic resonance imaging (MRI) has images of herniated discs in the lumbar spine.

+ Conformity between clinical and subclinical: The location of disc herniation on MRI is consistent with the clinical location.

- Research method: The patients were examined and diagnosed with disc herniation, randomly divided into the control group and the study group. Patients in both groups were treated conservatively with a background regimen of non-steroidal anti-inflammatory drugs. If the patient has severe pain with a VAS score ≥ 7 points, they will be given an epidural injection 3-4 times with Depo Medrol (Methyl Prednisolone 40mg) combined with 2% Lidocaine; a combination of physical therapy during 2 weeks in hospital (lumbar stretching, lumbar paraffin heating and electrical pulse), specifically as follows:

+ Control group (48 patients): Be treated with background regimen, combined with daily Mc Kenzie exercises (exercise with 6 positions, guided by medical staff to practice daily, continuously even when the pain is gone. If the patient is in too much pain to perform, stop the exercise).

+ Study group (48 patients): Be treated with background regimen, combined with exercises according to CS-A15 exercise program with 15 lumbar spine exercises. The first three exercises are posture instructions in the acute phase (the first seven days). The next 12 exercises are guided to the patient by rehabilitation technicians, who evaluate the ability to exercise according to each patient's pain level. Initially, only choose exercises that the patient finds a more comfortable response after exercise, reduce pain, or mild pain. If any exercise is too painful, do not perform it. When the pain level improves, they will instruct to continue practicing. They do enough exercises until pain relief or pain is gone that patients practice daily at home.

- Patients were evaluated three times (before treatment, after two weeks of treatment, and one month after treatment). The criteria for evaluating treatment results are VAS score, Schober index, Lasègue angle (nerve root tension) and the ODI.

- Ethical issues: The study was approved by the Ethics Committee of 103 Military Hospital. All personal information of the patient is kept confidential and used for research purposes only.

- Data processing: By statistical software.

3. RESULTS

Table 1. Distribution by age

Age	Study group (n = 48)	Control group (n = 48)	p
< 30	1 (2.1%)	0	> 0.05
31- 45	4 (8.3%)	7 (14.6%)	
46- 60	20 (41.6%)	10 (20.8%)	
> 60	23 (47.9%)	31 (64.5%)	
Average age	58.3 ± 10.9	60.2 ± 12.0	> 0.05

The proportion of patients increased gradually with age, the most common were patients over 60 years old (47.9% in the study group and 64.5% in the control group). The mean age of the patients in the study group (58.3 ± 10.9) and the study group (60.2 ± 12.0) were not statistically significant (p > 0.05).

Table 2. Distribution by sex

Sex	Study group (n = 48)	Control group (n = 48)
Male	22 (45.8%)	19 (39.6%)
Female	26 (54.2%)	29 (60.4%)
p	> 0.05	

There was no difference in sex between the study group and the control group, with p > 0.05.

Table 3. Level of pain relief after two weeks and one month of treatment according to the VAS scale

Evaluation time	Study group (X ± SD)	Control group (X ± SD)	p
Before treatment ⁽¹⁾	6.9 ± 1.4	6.8 ± 1.3	> 0.05
Two weeks after treatment ⁽²⁾	4.2 ± 0.9	4.2 ± 1.1	> 0.05
One month after treatment ⁽³⁾	1.8 ± 1.1 2.9 ± 0.7		< 0.001
p	p ₁₋₂ < 0.001 p ₂₋₃ < 0.001	p ₁₋₂ < 0.001 p ₂₋₃ < 0.001	

There was a significant reduction in pain according to the VAS scale in the study group and the control group at 2 weeks and 1 month after treatment compared to before treatment.

Pain level after 2 weeks of treatment did not differ between the study group and the control group, with p > 0.05.

However, after 1 month of treatment, the mean VAS score in the study group (1.8 ± 1.1 points) was significantly lower than the mean VAS score in the control group (2.9 ± 0.7 points), different from p < 0.001.

Table 4. Improve the degree of nerve root compression (Lasegue's angle)

Evaluation time	Study group (X ± SD)	Control group (X ± SD)	p
Before treatment ⁽¹⁾	61.6 ± 11.8°	59.8 ± 11.1°	> 0.5
Two weeks after treatment ⁽²⁾	64.7 ± 10.4°	63.7 ± 9.5°	> 0.05
One month after treatment ⁽³⁾	79.1 ± 8.2°	71.4 ± 11.9°	< 0.05
p	p ₁₋₂ < 0.001 p ₂₋₃ < 0.001	p ₁₋₂ < 0.001 p ₂₋₃ < 0.001	

Lasègue angle improved markedly in both groups after 2 weeks and 1 month of treatment.

After 1 month of treatment, the average of Lasègue angle in the study group patients ($79.1 \pm 8.2^\circ$) was statistically significantly larger than the mean Lasègue angle in the control group ($71.4 \pm 11.9^\circ$), different from $p < 0.05$.

Table 5. Schober index after treatment of two groups

Evaluation time	Study group (X ± SD)	Control group (X ± SD)	p
Before treatment ⁽¹⁾	12.4 ± 0.9 cm	12.1 ± 0.9 cm	> 0.05
Two weeks after treatment ⁽²⁾	13.2 ± 0.6 cm	12.9 ± 0.7 cm	> 0.05
One month after treatment ⁽³⁾	13,6 ± 0,2 cm	13,3 ± 0,4 cm	> 0.05
p	$p_{1-2} < 0.001$ $p_{2-3} < 0.05$	$p_{1-2} < 0.001$ $p_{2-3} < 0.05$	

After 2 weeks and 1 month of treatment, the Schober index in both the study group and the control group improved better than before treatment. The level of improvement in Schober index between study group and control group patients was not statistically significant, with $p > 0.05$.

Table 6. Improvement in the ODI after 2 weeks and 1 month of treatment

Oswestry Disability Index-ODI	Study group ^(A) (n = 48)			Control group ^(B) (n = 48)		
	Before treatment ⁽¹⁾	After two weeks ⁽²⁾	After one month ⁽³⁾	Before treatment ⁽¹⁾	After two weeks ⁽²⁾	After one month ⁽³⁾
Minimal disability (0-20%)	0	0	34 (70.8%)	0	1 (2.1%)	11 (22.9%)
Moderate disability (21-40%)	0	23 (47.9%)	14 (29,1%)	0	14 (29,1%)	27 (56,2%)
Severe disability (41-60%)	16 (33.3%)	23 (47.9%)	0	12 (25.0%)	20 (41.6%)	10 (20.8%)
Crippled (61-80%)	24 (50.0%)	2 (4.1%)	0	26 (54.1%)	13 (27.1%)	0
Bed bound (81-100%)	8 (16.6%)	0	0	10 (20.8%)	0	0
Average ODI	69.6 ± 12.8%	37.9 ± 10.6%	16.8 ± 11.4%	70.6 ± 11.2%	42.4 ± 11.8%	27.4 ± 11.6%
	$p_{1-2} < 0.001, p_{1-3} < 0.001$			$p_{1-2} < 0.001, p_{1-3} < 0.001$		
	$p_{A-B} < 0.05$					

After 2 weeks of treatment, both groups had no patients with bed bound; The ODI of disability decreased from 50.0% to 4.1% in the study group and from 54.1% to 27.1% in the control

group. In both groups of patients, the ODI after 2 weeks of treatment was significantly reduced compared to before treatment, different from $p < 0.001$.

After 1 month of treatment, in both groups, there were no patients with the ODI at the level of crippled and bed bound. The ODI after 1 month of treatment in both groups decreased on all subjects; the average ODI decreased to $16.8 \pm 11.4\%$ in the study group and $27.4 \pm 11.6\%$ in the control group; The difference in the ODI in patients in the control group and the study group was statistically significant, with $p < 0.05$.

4. DISCUSSIONS

- The results of Table 3 show that there is a clear reduction in pain level according to the VAS scale in patients in both groups 2 weeks after treatment and 1 month after treatment compared to before treatment. However, after 1 month of treatment, it was found that the group of patients who practiced the CS- A15 exercise program (average of VAS score was 1.8 ± 1.1 points) reduced pain better than the group of patients who practiced the Mc Kenzie exercises program (scores). The mean VAS was 2.9 ± 0.7 points), the difference was statistically significant, with $p < 0.05$.

- The results of Table 4 show that the Lasègue angle in patients in both groups improved significantly after 2 weeks and 1 month of treatment. However, after 1 month of treatment, the Lasègue angle in the group of patients with the CS-A15 exercise program improved significantly than in the group of patients with the Mc Kenzie exercises, the difference was statistically significant, with $p < 0.05$.

- The result of Table 5 show that, after 2 weeks and 1 month of treatment, Schober index in both groups improved better than before treatment. But there was no difference between the group of patients who exercised according to the CS- A15 exercise program and the group of patients who practiced the Mc Kenzie exercises ($p > 0.05$).

- The results of Table 6 show that, after 2 weeks of treatment, the ODI in both groups improved significantly compared to before treatment ($p < 0.001$); The improvement in the group of patients with the CS- A15 exercise program was better than that of the group of patients with the Mc Kenzie exercises program ($p < 0.05$). After 1 month of treatment, the ODI continued to decrease markedly in both groups, with $p < 0.001$. However, the average ODI in the group of patients with the CS-A15 exercise program ($16.8 \pm 11.4\%$) improved better than the group of patients with the Mc Kenzie exercises program (27.4 ± 11.6), the difference was statistically significant ($p < 0.05$).

- Nguyen Van Tuan et al. (2020) studied the CS-A15 exercise program on 100 patients with lumbar disc herniation (50 patients in the disease group and 50 patients in the control group), followed up for 3 months after the exercise. Results: Pain according to the VAS scale after 2 weeks of treatment decreased from 6.88 ± 1.34 points to 3.24 ± 1.06 points in the disease group and decreased from 6.66 ± 1.39 points down. There were 3.42 ± 1.32 points in the control group, the difference between the two groups was statistically significant, with $p < 0.0001$; the ODI after 2 weeks of treatment in the patient group decreased from $56.96 \pm 15.4\%$ to 42.06% , the control group decreased from $53.32 \pm 13.20\%$ to 48.32% , the average ODI after treatment all improved statistically, with $p < 0.0001$ [1]. Research by Pham Van Duc (2011) calculating ODI after 15 days and after 30 days from hospital discharge found that patients with lumbar disc herniation did Mc Kenzie exercises to reduce the degree of spinal function limitation [2].

A study by Alessandra N.G et al. (2013) comparing the effectiveness of Back School and Mc Kenzie methods on patients with non-specific chronic low back pain, found that the group of patients treated by Mc Kenzie method had an improved ODI better after 1 month of treatment. Alessandra N.G concludes: Mc Kenzie method is more effective than Back School method for people with disabilities [7]. Anas Mohammed A et al. (2019) conducted a review comparing the effects of Mc Kenzie exercises with stabilization exercises on pain and disability in individuals with chronic nonspecific low back pain, finding both Mc Kenzie exercises and stabilization exercises are both more effective than conventional exercise programs in reducing functional disability in patients with chronic nonspecific low back pain [6]. According to Steven J.M et al. (2020), the Mc Kenzie exercises method has been widely accepted as an effective program for back pain. The exercise emphasizes self-healing through posture correction and repetition of exercise movements with high frequency [5]. The Mc Kenzie exercise has been shown to be effective for patients with lumbar disc herniation in both the treatment phase and the long-term rehabilitation phase.

Our research results are consistent with domestic and international studies on rehabilitation for patients with disc herniation. The spinal mobilization program according to the CS-A15

exercise program in this study showed more effective effects than the Mc Kenzie exercises after 2 weeks of practice and even better after 1 month of rehabilitation. The CS-A15 exercise program has an improvement in function compared to the Mc Kenzie exercises which can be explained as follows:

(1) The program is developed in more detail with 15 intensive exercises, 3 exercises on lying down to relieve pain in the acute phase, the following 12 exercises are basic exercises to help reduce disc pressure, stretching muscles, loosening the joints, increasing the strength of the ligaments and muscles of the spine.

(2) The exercises are supervised by a rehabilitation technician; Before exercising, there is an assessment and selection of exercises suitable to the stage of the disease, the level of the disease and the patient's condition.

Therefore, the patient will adhere to the exercise regime better and have to exercise more actively than the instruction and distribution of self-practice leaflets of the Mc Kenzie exercises.

5. CONCLUSIONS

A study of 96 patients with lumbar disc herniation were treated at the Department of Neurology and the Department of Rehabilitation, Military Hospital 103, from October 2021 to September 2022, we concluded:

- After 2 weeks of treatment: Pain relief according to VAS scale, Lasègue angle, Schober index and the ODI in the study group and control group all improved significantly compared to before treatment, different from $p < 0.001$. The group of patients who exercised according to the CS-A15 exercise program had a better improvement in the ODI than the group of patients who practiced the Mc Kenzie exercises, the difference was statistically significant, with $p < 0.05$.

- After 1 month of treatment: The group of patients who exercised according to the CS-A15 exercise program and the Mc Kenzie exercises program both reduced pain, reduced nerve root tension (Lasègue), improved spinal mobility (Schober index) and the ODI, with $p < 0.0001$. The group of patients who practiced the CS-A15 exercise program had a better improvement than the group of patients who did the Mc Kenzie exercises in terms of pain relief (the mean VAS score of the study group was 1.8 ± 1.1 points, lower

than the control group: 2.9 ± 0.7 points), nerve root tension (Lasègue) and the ODI, different from $p < 0.05$.

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