



Original Article

## Efficacy of Korean Medicine Combination Treatment on Recurrent Neck Pain After Medical Procedures: A Retrospective Study



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### ABSTRACT

#### Article history:

Submitted: September 04, 2020

Revised: October 29, 2020

Accepted: November 11, 2020

#### Keywords:

acupuncture, herniated disc, Korean traditional medicine, neck surgery

**Background:** The aim of this study was to evaluate the efficacy of Korean medicine combination treatment on recurrent neck pain after medical procedures.

**Methods:** This retrospective study included 158 inpatients of the Daejeon Jaseng Hospital of Korean Medicine who were diagnosed with “Cervical disc disorder with radiculopathy (M50.1)” between December 14<sup>th</sup>, 2017 and May 29<sup>th</sup>, 2019. The patients were assigned to 1 of 2 groups based on whether they received medical procedures on the cervical spine at least once. Korean medicine combination treatment was evaluated using EuroQol-5 dimensions index (EQ-5D), numeric rating scale (NRS), and neck disability index (NDI) scores.

**Results:** Before and after treatment, the patients who received medical procedures on the cervical spine at least once before admission (Group A) showed a statistically significant difference in the NDI and NRS scores but not in the EQ-5D scores. This was similar to the patients who had not received medical procedures on the cervical spine before admission (Group B) they showed a statistically significant difference in the NDI and NRS scores but not in the EQ-5D scores. When comparing the results of Group A and Group B before and after treatment, no statistically significant differences were observed in the EQ-5D, NDI, and NRS scores.

**Conclusion:** Korean medicine combination treatment improves the neck functional disability of patients who suffer from recurrent neck pain despite patients having undergone medical procedures.

<https://doi.org/10.13045/jar.2020.00262>  
pISSN 2586-288X eISSN 2586-2898

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### Introduction

Cervical disc herniation can be generally classified into soft disc herniation and hard disc herniation. It is a disease that may cause pain and neurological symptoms in the neck, shoulders, and upper extremity because the cervical nerve root is compressed or stimulated by a displaced disc in soft disc herniation, and uncovertebral joint, vertebral body, and osteophytes formed in the facet joint in hard disc herniation [1,2]. Neurological symptoms contain paresthesia, dysesthesia, and muscle weakness [3].

The medical procedures offered to patients with cervical disc herniation are classified into conservative treatment and surgical treatment. Among the conservative treatments, epidural and nerve root blocks are typically used. If conservative treatment fails,

surgical treatment can be performed if required [4]. The types of surgical treatment include laminectomy, discectomy, artificial disc replacement, and spinal fusion.

The number of spinal surgeries has been increasing steadily from 2006 to 2018 [5] according to the data from Statistics Korea. In addition, the number of patients who have been admitted at Daejeon Jaseng Hospital of Korean Medicine for recurrent neck pain after receiving surgical and conservative medical treatment has increased. However, only few studies have been conducted regarding this. At this point, recurrent neck pain after receiving medical procedures contains cases such as the failure of medical procedures, no response to medical procedures, and the increase of the pain preceded by the decrease of pain right after medical procedures.

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Jeong et al [6], Lee et al [7], and Jo [8] reported the effective results of applying Chuna and traction therapy to patients who had surgery for cervical disc herniation. However, there is a lack of studies about Korean medicine combination treatment -two or more-including acupuncture, pharmacopuncture, Chuna, herbal medicine, and physical therapy which are typically used in clinical practice. This study was conducted in order to investigate the efficacy of Korean medicine combination treatment in patients with recurrent neck pain after medical procedures.

## Materials and Methods

### Patients

The medical records of patients who were admitted to Daejeon Jaseng Hospital of Korean Medicine who were diagnosed with cervical disc disorder with radiculopathy (M50.1) were reviewed from December 14<sup>th</sup>, 2017, to May 29<sup>th</sup>, 2019. There were a total of 187 patients who received Korean medicine treatments who qualified for this study.

The exclusion criteria for this study included:

- (1) Patients whose medical procedure was not clear.
- (2) Patients who did not reply to the discharge survey.
- (3) Patients who were discharged within 3 days.
- (4) Patients with severe disease which may have attributed to spinal pain (e.g., malignant tumors, spinal fractures, spinal infections, and inflammatory spondylitis).
- (5) Patients who have a chronic disease (e.g., fibrous root disease, and rheumatoid arthritis) or immune disease which may interfere with the interpretation of the treatment results.
- (6) Patients who did not receive consistent treatment during hospitalization.

In accordance with the exclusion criteria, 3 patients who did not answer the discharge survey, and 26 patients who were discharged within 3 days were excluded from this study. A total of 158 patients were included in this study, which consisted of 14 patients who had surgery before admission, 29 patients who had a medical procedure before hospitalization, and 115 patients who had not had an operation. There were 43 patients who received a medical procedure before hospitalization (Group A), and 115 patients who did not receive any medical procedure or surgery (Group B; Fig. 1). General characteristics of patients were analyzed and compared to ensure intergroup homogeneity.

This study was approved by the Institutional Review Board of the Daejeon Jaseng Hospital of Korean Medicine (IRB file no.: 2020-04-013).

### Methods

There were 158 patients who had undergone combination treatment for cervical disc herniation at Daejeon Jaseng Hospital of Korean Medicine who were included in this study from a total number of 187 inpatients. Statistical analysis was performed using the SPSS 20.0 Windows software (IBM Corp., Armonk, USA). Analysis included:

- (1) Gender
- (2) Age
- (3) Onset date
- (4) Administration date, discharge date, and hospitalization period (days)
- (5) Whether neck-related medical procedures were administered before hospitalization and the kind of procedures received
- (6) Comorbidities
- (7) Physical examination before and after treatment

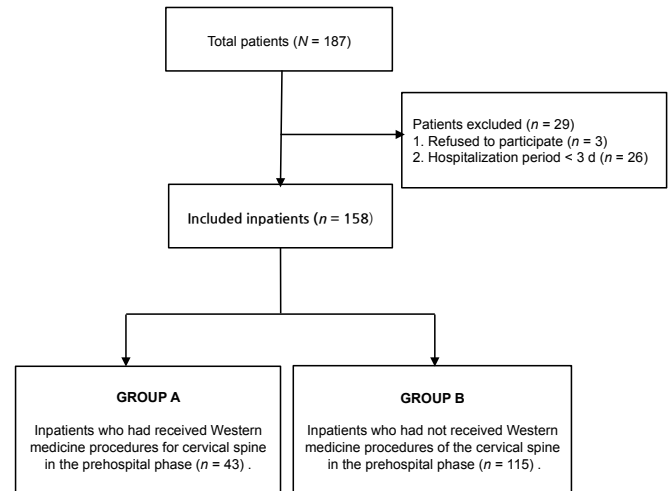


Fig. 1. Flow chart.

- (8) C-spine magnetic resonance imaging (MRI) scans
- (8) Scores from EuroQol-5 dimensions index (EQ-5D), the numeric rating scale (NRS), and neck disability index (NDI) before and after treatment
- (9) Adverse events during hospitalization
- (10) Treatment contents

### Treatments

During hospitalization, the patients received acupuncture treatment, pharmacopuncture treatment, Chuna treatment, herbal medicine treatment, and physical therapy. All treatments were performed by 1 or 2 consistent experienced Korean medicine doctors who have worked in a Daejeon Jaseng hospital of Korean Medicine for more than 2 years. The patients included in this study were not related to the Korean medicine doctor who performed the treatment, and the evaluation of the assessment scores were performed by another Korean medicine doctor.

#### Acupuncture treatment

Each patient received acupuncture twice a day, performed by 2 Korean medicine doctors, using disposable stainless steel needles either  $0.20 \times 30 \text{ mm}^2$  or  $0.25 \times 30 \text{ mm}^2$  (Dongbang Inc., Ltd., Boryeong, Korea) in size. The acupuncture points Cheonju (BL10), Gyeonryo (TE14), Pungji (GB20), Pungbu (GV16), Gyeonjeong (GB21), Hwata Hyeopcheok (EX-B2) and the Ashi points of the neck, shoulder, and upper limbs were used.

The mean time duration of the acupuncture treatment was 10 minutes, twice a day, and the mean needle insertion depth was 10-30 mm.

In the acupuncture treatment administered, infrared therapy and electrical stimulation were applied together. Electrical stimulation (1-25 Hz) was performed at 2 acupuncture points using a low-frequency treatment device (STN-330 Stratek, Anyang, Korea) to give sufficient muscle contraction without the patient feeling pain.

#### Pharmacopuncture treatment

Shinbaro pharmacopuncture (Jaseng Pharmacopuncture Medicinal Research Institute) is pharmacopuncture developed from herbal substances that are used for Cheongpa-jeon which has anti-inflammatory, nerve regeneration, cartilage protection, and

pain control effects [9,10].

Essential bee venom pharmacopuncture (the saline:bee venom ratio was 10,000:1) was applied after a negative hypersensitivity skin test. Essential bee venom is a bee venom pharmacopuncture that eliminates phospholipase A2, histamine, which are reported to be major allergens and preserve melittin, which is a major active component of bee venom [11].

The pharmacopuncture treatment was performed based on the patient's cervical MRI, area of pain, and symptoms. A total of 1 mL of Shinbaro or essential bee venom pharmacopuncture was injected into the EXB2 point at the spinal level with the most severe stage of herniation or pain.

Pharmacopuncture needles were inserted directly into the skin to a depth of 0.5-1 cm, and each acupuncture point was injected with approximately 0.2-0.5 mL using a disposable syringe (1 mL, 26 G × 1.5 syringe; CPL Co., Ltd., Gyeonggi, Korea). To avoid infection, the treatment area was disinfected using povidone solution (10%). The pharmacopuncture procedure was performed once a day by a Korean medicine doctor.

#### Chuna treatment

Chuna treatment was performed once a day by a Korean medicine doctor during hospitalization. JS supine cervical distraction technique and supine cervical manipulation technique [12] were performed.

#### Herbal medicine

Shinbaro herbal medicines (Jaseng hospital prescriptions), Cheongpa-jeon, and Cheongshinbaro-hwan for cervical disc herniation were administered to the patients due to the anti-inflammatory properties, nerve regeneration, cartilage protection, and pain control (Table 1) [13]. Cheongpa-jeon and Cheongshinbaro-hwan were taken 3 times a day, 30 minutes after each meal, from the day of admission.

#### Other treatments

Manual therapy, traction therapy, or herbal fumigate hot packs were applied from the day of admission, 5-7 days a week for the duration of hospitalization, taking into account each patient's condition.

#### Evaluation indexes

The patients completed the EQ-5D, NRS, and NDI tests on both the day of admission and the day of discharge.

#### EQ-5D

EQ-5D is an index value developed by the EuroQol group to measure health-related quality of life and is one of the most widely used evaluation tools. The EQ-5D questionnaire consists of 5 categories: mobility, self-care, usual activities, pain or discomfort,

and anxiety or depression. The higher the EQ-5D score, the higher the quality of life [14].

#### NRS

NRS is a pain evaluation method in which a patient selects a number corresponding to his or her pain level. NRS 11 point (0 to 10) is commonly used. The numerical scale is very simple, convenient, and easy for the patient to understand, which are its advantages [15].

#### NDI

The NDI is a self-assessment survey that assesses the patient's degree of disability due to neck pain, and consists of 10 questions with 6 choices each, each item corresponding to 0-5 points. The NDI score is the sum of each item; the higher the score, the greater the dysfunction associated with cervical abnormality. The Korean version of the NDI was used in this study, the reliability and validity of which have been verified [16].

#### **Statistical analyses**

Statistical analysis was performed using the SPSS 20.0 Windows software (IBM Corp., Armonk, USA). Measurements were expressed as the mean ± SD. To compare homogeneity between the 2 groups, gender, distribution of comorbidities, hypesthesia, and muscle weakness were analyzed using a Chi-square test. Age, height, weight, and days of hospitalization were analyzed using an independent 2-sample *t* test. An independent 2-sample *t* test was used to compare the differences in general characteristics and the EQ-5D, NDI, and NRS scores between the 2 groups. A paired *t* test was used to compare differences in the EQ-5D, NDI, and NRS scores before and after treatment in each group. Statistically significance was reached when  $p < 0.05$ .

#### **Results**

##### **General characteristics of patients**

Group A who had a neck-related procedure ( $n = 43$ ) consisted of 26 women and 17 men, with an average age of  $53.28 \pm 9.58$  years. The average height was  $163.5 \pm 8.57$  cm, the average weight was  $63.02 \pm 13.09$  kg, and the average hospitalization period was  $15.33 \pm 11.96$  days. Group B who did not undergo a neck-related procedure ( $n = 115$ ) consisted of 78 women and 37 men, with an average age of  $53.18 \pm 10.41$  years. The average height was  $161.65 \pm 8.07$  cm, the average weight was  $61.27 \pm 10.39$  kg, and the average hospitalization period was  $18.28 \pm 13.28$  days. Demographics and patient characteristics were not significantly different between Group A and Group B (Table 2).

Table 1. Herbal Medicine Prescriptions.

Cheongpa-jeon	Lasiosphaera Seu Calvatia 11.25g, Acanthopanax Cortex-Eucommiae Cortex-Ledebouriellae Radix-Achyranthis Radix-Cibotii Rhizoma 7.5g, Atractylodis Rhizoma alba-Amomi Semen-Geranii Herba-Scolopendra 3.75g, Glycyrrhizae Radix 2.5g, Zingiberis Rhizoma 1.875 g.
Cheongshinbaro-hwan	Rehmanniae Radix 0.208g, Mel 0.104g, Pachyma hoelen rumphius 0.052g, Ginseng Radix 0.026g, Glue of Cervi Parvum Cornu and Cervi Cornu 0.022g, Atractylodis Rhizoma alba 0.017g, Achyranthis Radix 0.013g, Cibotii Rhizoma-Eucommiae Cortex-Cibotii Rhizoma, Gallbladder of Bos taurus L. 0.009g, Gelatinum 0.006g, Achyranthis Radix-Ledebouriellae Radix-Acanthopanax Cortex-Scolopendra 0.004g, Cheongshinbaro-hwan dried extract 0.5g

### Comorbidities of patients

Gastrointestinal disease was significantly higher in Group A compared with Group B ( $p = 0.004$ ). However, no significant differences were observed between groups for hypertension, diabetes mellitus, depression, or cardiovascular disease (Table 3).

### Hypesthesia and muscle weakness in the upper extremities of patients before treatment

Patients with upper extremity hypesthesia before treatment accounted for 16.3% of Group A and 11.6% of Group B, which was statistically significantly different ( $p = 0.012$ ). Patients with upper extremity muscle weakness before treatment accounted for 11.6% of Group A and 7.0% of Group B, which was not statistically significantly different between groups (Table 4).

Table 2. General Characteristics of Patients.

	Age (y) ‡	Gender <sup>§</sup>		Height (cm) ‡	Weight (kg) ‡	Hospitalization period (d) ‡
		Female	Male			
Group A* (n = 43)	53.28 ± 9.58	26	17	163.50 ± 8.57	63.02 ± 13.09	15.33 ± 11.96
Group B† (n = 115)	53.18 ± 10.41	78	37	161.65 ± 8.07	61.27 ± 10.39	18.28 ± 13.28
<i>p</i>	0.958	0.385		0.215	0.388	0.203

Data are presented as mean ± SD.

\* Group A, patients had received the medical procedure of the cervical spine in the prehospital phase.

† Group B, patients had not received the medical procedure of the cervical spine in the prehospital phase.

‡ Statistical significance was evaluated using an independent 2 sample *t* test.

§ Statistical significance was evaluated using the Chi-square test.

Table 3. Comorbidities of Patients.

Comorbidity	Group A† n (%)	Group B‡ n (%)	<i>p</i>
Hypertension	12 (27.9)	22 (19.1)	0.418
Diabetes mellitus	6 (14.0)	9 (7.8)	0.242
Depression	0 (0.0)	1 (0.9)	0.540
Cardiovascular disease	8 (18.6)	19 (16.5)	0.757
Respiratory disease	5 (11.6)	15 (13.0)	0.781
Gastrointestinal disease	12 (27.9)	11 (9.6)	0.004*

Statistical significance was evaluated using the Chi-square test.

\* $p < 0.05$ .

† Group A, patients had received the medical procedure of the cervical spine in the prehospital phase.

‡ Group B, patients had not received the medical procedure of the cervical spine in the prehospital phase.

Table 4. Hypesthesia and Muscle Weakness in Upper Extremity of Patients at Pretreatment.

	Group A† n (%)	Group B‡ n (%)	<i>p</i>
Hypesthesia	7 (16.3)	5 (4.3)	0.012*
Muscle weakness	5 (11.6)	3 (7.0)	0.342

Statistical significance was evaluated using the Chi-square test.

\* $p < 0.05$ .

† Group A, patients had received the medical procedure of the cervical spine in the prehospital phase.

‡ Group B, patients had not received the medical procedure of the cervical spine in the prehospital phase.

### Types of medical procedures

The procedures, before patients of Group A were admitted to hospital, included the nerve block procedure, discectomy, laminectomy, laminoplasty, artificial disc replacement (ADR), and anterior cervical interbody fusion (ACIF). The most frequently performed procedure was the nerve block procedure, accounting for 67.4% of the total procedures performed before hospitalization. Three patients received both the ADR and ACIF, and 1 patient received ADR, ACIF, and nerve block procedure combined (Table 5).

### Distribution of C-spine MRI findings

The number of herniated discs ranged from 1 to 6. In Group A, 3 patients had 1 herniated disc (7.0%), 2 patients (4.7%) had 2 herniated discs, 7 patients (16.3%) had 3 herniated discs, 21 patients (48.8%) had 4 herniated discs, 5 patients (11.6%) had 5 herniated discs, and 5 patients (11.6%) had 6 herniated discs. In Group B, 2 patients had 1 herniated disc (1.7%), 13 patients (11.3%) had 2 herniated discs, 27 patients (23.5%) had 3 herniated discs, 24 patients (20.9%) had 4 herniated discs, 34 patients (29.6%) had 5 herniated discs, and 15 patients (13.0%) had 6 herniated discs.

The majority of herniated discs, based on the cervical MRI images for each group were graded as protrusion [67.4-83.5% (Group A-Group B)]. In Group A, 9 patients (8.2%) at position C2/3 had the most severe herniated disc, 24 patients (20.0%) at position C3/4, 30 patients (25.0%) at position C4/5, 31 patients (25.8%) at position C5/6, 23 patients (19.2%) at position C6/7, and 3 patients (2.5%) at position C7/T1. In Group B, 27 patients (8.2%) at position C2/3 had the most severe herniated disc, 51 patients (15.5%) at position C3/4, 64 patients (19.4%) at position C4/5, 92 patients (27.9%) at position C5/6, 76 patients (23.0%) at position C6/7, and 20 patients (6.1%) at position C7/T1 (Table 6).

### Comparison of the EQ-5D, NDI, and NRS scores

#### Differences in EQ-5D, NDI, and NRS scores at pretreatment between Groups A and B

Before treatment, the EQ-5D average scores between Group A

Table 5. Types of Medical Procedures Received by Group A.

Type	Group A* n (%)
Nerve block	29 (67.4)
Discectomy	1 (2.3)
Laminectomy	1 (2.3)
Laminoplasty	1 (2.3)
ADR	7 (16.3)
ADR and ACIF	3 (7.0)
ADR, ACIF and nerve block	1 (2.3)
Total	43 (100.0)

\*Group A, patients had received the medical procedure of the cervical spine in the prehospital phase.

ADR, artificial disc replacement; ACIF, anterior cervical interbody fusion.

and Group B were  $0.62 \pm 0.20$  and  $0.65 \pm 0.16$ , respectively. The NDI average scores were  $39.28 \pm 19.62$  and  $35.29 \pm 16.05$ , and the NRS scores were  $6.02 \pm 1.72$  and  $6.18 \pm 1.42$ , respectively. There was no statistically significant differences in the EQ-5D, NDI, and NRS scores between groups (Table 7).

#### Differences in EQ-5D, NDI, and NRS scores before and after treatment in Group A

In Group A, the NDI scores before and after treatment ( $39.28 \pm 19.62$  and  $32.05 \pm 19.01$ , respectively) were statistically significantly different ( $p < 0.001$ ), and the NRS scores before and after treatment ( $6.02 \pm 1.72$  and  $3.88 \pm 1.64$ , respectively) were statistically significantly different ( $p < 0.001$ ). However, there was no statistical difference between the EQ-5D scores before and after treatment ( $0.62 \pm 0.20$  to  $0.62 \pm 0.31$ ;  $p = 0.751$ ; Table 8).

#### Differences in EQ-5D, NDI, and NRS scores before and after treatment in Group B

In Group B, the NDI scores before and after treatment ( $35.29 \pm 16.05$  and  $27.94 \pm 13.97$ , respectively) showed a statistically significant difference ( $p = 0.002$ ), and the NRS scores ( $6.18 \pm 1.42$  and  $3.99 \pm 1.57$ , respectively) showed a statistically significant difference ( $p < 0.001$ ). However, the EQ-5D scores before and after

Table 6. Distribution of C-spine MRI Findings.

	Herniated disc	Group A* n (%)	Group B † n (%)
No.	1	3 (7.0)	2 (1.7)
	2	2 (4.7)	13 (11.3)
	3	7 (16.3)	27 (23.5)
	4	21 (48.8)	24 (20.9)
	5	5 (11.6)	34 (29.6)
	6	5 (11.6)	15 (13.0)
	7	0 (0.0)	0 (0.0)
Grade	Bulging	1 (2.3)	5 (4.3)
	Protrusion	29 (67.4)	96 (83.5)
	Extrusion	13 (30.2)	14 (12.2)
Position	C1/2	0 (0.0)	0 (0.0)
	C2/3	9 (8.2)	28 (8.2)
	C3/4	24 (20.0)	51 (15.5)
	C4/5	30 (25.0)	64 (19.4)
	C5/6	31 (25.8)	92 (27.9)
	C6/7	23 (19.2)	76 (23.0)
	C7/T1	3 (2.5)	20 (6.1)

\* Group A, patients had received the medical procedure of the cervical spine in the prehospital phase ( $n = 43$ ).

† Group B, patients had not received the medical procedure of the cervical spine in the prehospital phase ( $n = 115$ ).

MRI, magnetic resonance imaging.

Table 7. Differences in EQ-5D, NDI, and NRS at Pretreatment Between Group A and B.

Pretreatment	Group A* (n = 43)	Group B† (n = 115)	p
EQ-5D	0.62 ± 0.20	0.65 ± 0.16	0.443
NDI	39.28 ± 19.62	35.29 ± 16.05	0.237
NRS	6.02 ± 1.72	6.18 ± 1.42	0.559

Data are presented as means ± SD.

Statistical significance was evaluated using an independent 2 sample *t* test.

\*Group A, patients had received the medical procedure of the cervical spine in the prehospital phase.

†Group B, patients had not received the medical procedure of the cervical spine in the prehospital phase.

EQ-5D, EuroQol-5 Dimension; NDI, neck disability index; NRS, numerical rating scale.

Table 8. Differences in EQ5D, NDI, and NRS Before and After Treatment in Group A.

	Timing of treatment	Group A† (n = 43)	p
EQ-5D	Before	0.62 ± 0.20	0.751
	After	0.62 ± 0.31	
NDI	Before	39.28 ± 19.62	< 0.001*
	After	32.05 ± 19.01	
NRS	Before	6.02 ± 1.72	< 0.001*
	After	3.88 ± 1.64	

Data are presented as means ± SD.

Statistical significance was evaluated using an independent 2 sample *t* test.

\**p* < 0.05.

†Group A, patients had received the medical procedure of the cervical spine in the prehospital phase.

EQ-5D, EuroQol-5 Dimension; NDI, Neck disability index; NRS, numerical rating scale.

treatment did not show any statistically significant results (0.65 ± 0.16 to 0.65 ± 0.31; *p* = 0.941; Table 9).

#### Differences of variation in EQ-5D, NDI, and NRS scores before and after treatment between Groups A and B

The difference between EQ-5D scores before and after treatment were 0.00 ± 0.30 in Group A, and -0.01 ± 0.20 in Group B, which was not significantly different. The difference between NDI scores before and after treatment were 7.16 ± 13.98 in Group A, and 7.34 ± 10.35 in Group B, which was not significantly different. The difference between NRS scores before and after treatment were 2.19 ± 1.58 in Group A, and 2.19 ± 1.46 in Group B which was not significantly different (Table 10).

#### **Discussion**

The cervical vertebrae and muscles around the neck form a structure that allows the head to move in all directions whilst maintaining stability and the neck holds the weight of the head in an upright position. The neck is vulnerable to stress and strain, and potentially serious damage because of its structural characteristics, and chronic problems can occur in cases of bad posture maintained [17]. For this reason, cervical vertebrae diseases are common, and among them cervical disc herniation is one of the

frequently treated diseases. The causes of cervical disc herniation vary from repeated movements in daily life (repetitive strain), traffic accidents, and trauma to degeneration, and its incidence has increased in modern society [18].

Cervical disc herniation can be classified into soft cervical disc herniation, which occurs when the cervical nerve roots are compressed or stimulated by displaced intervertebral discs, and hard cervical disc herniation, which is caused by compression or stimulation by structures such as vertebral joints, vertebral bodies, and osteophytes. Soft disc herniation often occurs between the ages of 30-40 years, whereas hard disc herniation typically occurs over 50 years, and lesions usually occur at the C5/6 and C6/7 [19]. The main symptoms are pain in the neck, scapula, and thoracic vertebrae and radiation pain in the upper extremities. In addition, muscle weakness or paresthesia may occur. The neuromuscular symptoms of cervical disc herniation appear in various ways depending on the nerves compressed by the disc herniation [20].

Studies evaluating the efficacy of Korean medicine treatments (such as acupuncture [21], pharmacopuncture [22], bee venom pharmacopuncture [23,24], chuna [25], and moxibustion [26]) for neck pain have been reported to have a significant effect on the reduction of neck pain. Among the Korean medicine treatments for neck pain, acupuncture, and cupping are the most common. In addition, combined treatments rather than a single

Table 9. Differences in EQ5D, NDI, and NRS Before and After Treatment in Group B.

	Treatment	Group B <sup>†</sup> (n = 115)	p
EQ-5D	Before	0.65 ± 0.16	0.941
	After	0.65 ± 0.31	
ODI	Before	35.29 ± 16.05	0.002*
	After	27.94 ± 13.97	
NRS	Before	6.18 ± 1.42	< 0.001*
	After	3.99 ± 1.57	

Data are presented as means ± SD.

Statistical significance was evaluated using an independent 2 sample *t* test.

\**p* < 0.05.

<sup>†</sup>Group B, patients had not received the medical procedure of the cervical spine in the prehospital phase.

EQ-5D, EuroQol-5 Dimension; NDI, Neck disability index; NRS, numerical rating scale.

Table 10. Differences of Variation in EQ-5D, NDI, and NRS Before and After Treatment Between Group A and Group B.

Variation	Group A* (n = 43)	Group B <sup>†</sup> (n = 115)	p
EQ-5D	0.00 ± 0.30	-0.01 ± 0.20	0.850
NDI	7.16 ± 13.98	7.34 ± 10.35	0.931
NRS	2.19 ± 1.58	2.19 ± 1.46	0.998

Data are presented as means ± SD.

Statistical significance was evaluated using an independent 2 sample *t* test.

\*Group A, patients had received the medical procedure of the cervical spine in the prehospital phase.

<sup>†</sup>Group B, patients had not received the medical procedure of the cervical spine in the prehospital phase.

EQ-5D, EuroQol-5 Dimension; NDI, Neck disability index; NRS, numerical rating scale.

treatment are typically used in clinical practice [27]. Hurwitz et al [28] reported acupuncture, manual therapy, exercise, and low-level laser therapy are more effective than no treatment, sham, or alternative interventions. Amongst the noninvasive treatments for neck pain, a consensus on the most effective treatment for cervical disc herniation has not yet been reached because there are various treatment methods and different interpretations of treatment effects. Conservative noninvasive treatments for cervical disc herniation include limited physical activity, traction therapy, physical therapy, manual therapy, and injection therapy (e.g., nerve block procedure). Among these, nerve block procedure is an injection treatment commonly used in orthopedics and neurosurgery.

When secondary pain occurs due to inflammation around the nociceptor and its pathways, a nerve block can be used to prevent or alleviate pain by producing anesthesia. Local anesthetics and steroids control neural reflex, hypersensitivity, and hyperexcitability. This contributes to the healing of tissues by increasing blood flow to the sympathetic nerves and motor nerves removing metabolites, and aiding muscle relaxation. However, side effects may occur such as anaphylaxis, infection, paralysis (injection in cervical spinal cord), cord infarction and death, epidural lipomatosis, epidural abscess, epidural hematoma, and retinal hemorrhage may result from this procedure.

Conservative treatment is non-invasive which is an advantage; however, if pain is continuous in the upper limbs, progressive, causing severe muscle weakness, or numbness, despite 6 months of conservative treatment, surgery is required. A laminectomy is a surgical procedure performed to remove the lamina to relieve nerve compression or expose the spinal cord or intervertebral disc. Discectomy is a surgical method that eliminates the lesion by removing the herniated intervertebral disc, and it combines fusion with a cage or artificial disc insertion. Cervical artificial disc replacement has been developed to overcome many complications of spinal fixation, and it has advantages such as the preservation of the physiological movement of the spine and reduction of the degeneration of adjacent nodes. However, side effects may occur, including vocal dysfunction, vocal cord paralysis, vertebral artery gland, damage of the carotid artery and internal jugular vein and nerve, esophageal perforation, airway damage, chest lymphatic tube damage, and movement of the device. Degenerative lesions of the adjacent segments due to such invasive methods are a typical complication [29]. Its clinical effect is marginal, and its effectiveness and stability are based on limited evidence [30].

Huh et al [31] reported that the number of patients who had received treatments only at Western medicine institutions for neck pain, was the largest among patients who were consequently admitted to Korean medicine hospitals for neck pain. Including the

number of patients who had been admitted at Western medicine institutions for neck pain, the number accounted for more than half of the hospitalized patients admitted to Korean medicine hospitals for neck pain. This indicates that recurrent neck pain was not cured by the medical procedures received. The necessity of evaluating efficacy of the Korean medicine combination treatment for neck pain has also increased to see if it can satisfy the expectations for patients whose medical procedures for neck pain have failed.

A fair number of Korean medicine studies related to the treatment of neck pain are conducted regardless of whether a patient had received medical procedures. In addition, there are insufficient studies on Korean medicine combination treatment which is mostly used in the clinic for recurrent neck pain after medical procedures. Therefore, this study was designed to quantitatively evaluate Korean medicine combination treatment for recurrent neck pain after the failure of medical procedures. In this study, EQ-5D was used to evaluate the improvement of quality of life, NDI was used to evaluate the improvement of neck dysfunction, and NRS was used to evaluate the improvement of neck pain.

The reduction in NDI and NRS scores of Group A (who received a medical procedure or surgery before hospitalization) showed significant improvement after undergoing Korean medicine combination treatment ( $p < 0.001$  and  $p < 0.001$ , respectively). In Group B (patients who did not receive a medical procedure or surgery) the NDI and NRS scores after treatment also decreased ( $p = 0.002$  and  $p < 0.001$ , respectively). This suggests that Korean medicine combination treatment may be a good alternative to medical procedures for patients with cervical disc herniation, recurrent neck pain after medical procedures and failed surgical treatment.

However, this study has some limitations. This study was a retrospective study of inpatients without follow-up after discharge to determine whether the treatment effect was sustained. A consistent practitioner treated the patient during the hospitalization period, but it was not possible to access the variables for each practitioner. Moreover, the patients received Korean medicine combination treatment, but it was difficult to control differences in treatment content received between patients. In addition, because the study was targeted on combination treatment, it was not possible to determine which treatment had the main treatment effect, and whether a difference in the effect of the treatment methods was observed. In Groups A and B, the NDI and NRS scores showed significant improvement, but the EQ-5D scores which assess the quality of life, did not show a significant difference between pre and post treatment in both groups. The number of patients who received medical procedures before hospitalization was relatively smaller than those who did not. In addition, no comparison was performed between the types of medical procedures performed, the length of time from the medical procedure to being admitted to the Korean medicine hospital, age, and gender. Future prospective studies, monotherapy-related studies, and more objective evaluation tools will be needed.

## Conclusion

This study was conducted on 158 patients with neck pain and neurological symptoms in the shoulder and upper extremities among patients who were admitted at Daejeon Jaseng Hospital of Korean Medicine from December 14<sup>th</sup>, 2017, to May 29<sup>th</sup>, 2019, and who received a combination of Korean medicine treatments. EQ-5D, NDI, and NRS scores were taken at admission and discharge for each patient. On this basis, the effectiveness of Korean medicine

combination treatment was evaluated, and the following results were obtained:

1. The NDI and NRS scores showed statistically significant improvements after treatment in the patient group who received medical procedures before hospitalization. The EQ-5D scores did not show statistically significant differences.

2. The NDI and NRS scores showed statistically significant improvements after treatment in the patient group who did not receive medical procedures before hospitalization. However, the EQ-5D scores did not show statistically significant differences.

3. The comparison of the differences between the EQ-5D, NDI, and NRS scores before and after treatment between the groups was not statistically significant.

## Conflicts of Interest

The authors have no conflicts of interest to declare.

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