

## Effect of Myofacial Release and Cryotherapy in Acute Whiplash Injury

The purpose of this study is to provide the case of influence of myofacial release(MFR) and cryotherapy in acute whiplash injury. The subjects were consisted of 3 adults(2 males, 1 female) who had been diagnosed with whiplash injury. The performance period was 1 weeks, 6 times and 1 time is 40min(MFR: 20min, cryotherapy: 20min). We measured neck pain(Visual analogue scale, VAS) and cervical alignment(cervical curvature & line of gravity). All measurements of each subject were measured at pre-treatment and post-treatment. The results are listed below.

The neck pain(VAS) index decreased from 7.54cm to 4.11cm. The cervical curvature increased from 23.62° to 29.76°. The line of gravity decreased from 8.03mm to 3.66mm. Based on the results, it can be suggested that both MFR and cryotherapy can be used to neck pain and alignment in acute whiplash injury.

Key words: *Myofacial Release; Cryotherapy; Whiplash Injury*

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## INTRODUCTION

Whiplash injury is mainly caused by a car accident and is one of the major causes for a neck injury(1). This is an excessive bending of the neck area due to the accelerating force of the head, which does not only cause the pain in the neck, but cause damages to one or more of the cervical vertebra(2). Pains in the neck and head is a common clinical symptoms that can caused by the whiplash(3), which causes pains in the neck muscles in the back and upper trapezius(4). Michael(5) reported that it assessed the range of active movement of the neck for 76 patients, the range was reduced, and Chen(1) reported that patients showed a symptom of stiffness, bending deformity which resulted in the reduction of cervical lordosis. In this respect, whiplash injury shows a symptom of pain, stiffness in the neck or weakening of the shoulder muscle. For a patient who suffers from pains on the neck and shoulders, an activity of upper trapezius seems excessive and the

activity of lower trapezius and serratus anterior can be reduced(6). This disproportion between muscles can lead into a chronic whiplash(7).

Disproportion on muscles limits the fascia, which is a membrane surrounding muscles, and could cause abnormal dysfunction(8). The fascia is comprised of strong connective tissue that have a resistance against mechanical stress internally and externally(9). Evans(10) reported that the pains from the whiplash injury can be caused by damages on fascia. Myofacial release, which is one of the methods widely used to treat fascia, is a highly advanced method to appropriately set up the direction and posture of a patient to facilitate the maximum relaxation of tense muscles(11). The method provides spacious room for bone structure, nerves and blood vessels to properly function by extending shortened parts of fascia while improving the vertical arrangement of fascia(8), which leads a disproportion of balance(9).

For treatments of damages on the musculoskeletal system in an acute phase, cryotherapy,

stabilization, oppression and, listing can be applied (12). Cryotherapy is a method designed to reduce temperature on a localized tissue with ice pack and ice massage and can reduce pain, spasm, infection and edema. It is particularly effective in curbing agitation of nerve ending and reducing the speed of conducting nerves depending on peripheral nerves, which results in the increase of pain's threshold(13,14).

One of the goals of a whiplash patient is to reduce pain. Cryotherapy is a sphere of physical treatment effectively reducing pains by alleviating conductivity of harmful water-soluble fiber and localized inflammation (15). It has been suggested in previous studies that changes in the temperature in cryotherapy varied depending on the area and period of time(16, 17). Tepperman & Delvin(18) suggested that it should be applied for 20 to 30 minutes for the optimal effects of cryotherapy.

It is imperative to treat acute pains since it could turn to chronic pains if it is not properly addressed(5, 19). Spitzer(20) indicated that an active mediation on the neck of whiplash patient was more effective than a passive treatment(rest or prosthesis).

Thus, this study aims to discover pains on the neck of whiplash patients and changes in the position arrangement when applied with myofacial release and cryotherapy.

## METHODS

### Subject

This is a case study on three patients who has recently been diagnosed, within one month, with acute whiplash injury due to damages from car accidents and has been admitted to a hospital for two weeks at S Hopital in Yongin. All subjects were free of other symptoms such as fractured bone, degenerated disc and damages on nervous system except for the whiplash injury and were provided with an explanation regarding the goal of this study, which they all agreed.

All subjects were hospitalized due to a car accident caused by a crash on the back and were reported to drive the car wearing seat belt.

Subject 1 was a 54 years old male and was admitted to a hospital on November 12th, 2012 due to a car accident. He has a healthy physique with the height of 172cm and weight of 75kg and told us that he had no pains on the neck and structural and muscular system as usual. While he was able to carry out everyday life, he was suffering from a limited movement on the neck and stiffness due to pains.

Subject 2 was a 44 years old male and was admitted

to a hospital on November 18th, 2012 due to a car accident whose height is 170cm and weight is 72kg. He suffered from pains on the neck and headache. He said that he usually had no pains on the neck and musculoskeletal or nervous diseases. But he was suffering from a limited movement of the neck and pains accompanied by pains, though he did not have major discomfort in carrying out everyday life.

Subject 3 was a 33 years old female and was hospitalized on November 20th, 2012 who has a little bit of a painful physique; 156cm of height and 44kg of weight. She had no pains on the neck and musculoskeletal diseases as usual, though she was suffering from stiffness on the neck area and pains on the neck and waist at the time of a medical examination by interview. She was experiencing a major discomfort in her everyday life due to stiffness and pains on the neck.

### Measuring Instrument

#### Pain

To assess the neck pain, Visual Analogue Scale(VAS) has been used. This method was designed by Bond and Piowsky in 1966 to assess pains and was found to have high reliance at 0.9 in the reliance between measurers according to the study by Polly et al.(21) VAS indicates patients to mark the level of pain on a scale of 10 in a 10cm of horizon; the left end of the horizon is painless or '0' and the right end of the horizon is the most painful or '10'.

#### Cervical alignment

The cervical spine the secondary lordosis in the process of standing erect, which not only provides elasticity to the vertebra, but balances the centroid of the cranial bones applied to vertebra(22). In addition, it supports the head as well as delivers the strength upraised from the body. In this reason, proper arrangement of the cervical spine is imperative(23).

To assess the cervical alignment, we measured the cervical curvature and line of gravity through the lateral view we have been able to get from an autoradiography. To measure the curvature of the cervical vertebra, we drew horizontal line connecting the Anterior and posterior tubercle of the coccyx and drew extended line connecting the bottom area of C7. After that, we drew vertical line against the extended line and then crossed them to measure the angle (24). In spinal curvature, cervical lordosis whose normal angle is 30° to 35°. If the angle is less than 30°, it would mean that the cervical curvature is reduced. And we drew the line of gravity from the apex of odontoid process to a vertically downward

direction and observed whether the line passed the front of C7. If the line passes through the front of C7, it is easy to induce chronic muscle pain or disc. If the line of gravity is passing in front of C7, it is likely to cause chronic muscle pain or disk(24).

**Procedure**

The study has been conducted for one week, a total of six times, and we carried out Myofacial release and cryotherapy. Each Myofacial release and cryotherapy were applied for 20 minutes respectively per treatment, 40 minutes in total and the treatment methods are as follows.

**Myofacial release group**

Whiplash injury can cause pains in the neck area. Myofacial release on the base of cranial bones is a method very effective in reducing pains on the neck area(25). This study has applied cranial bones fundus release and localized release of both upper trapezius. Myofacial release was carried out for 20 minutes so fascia can fully be relaxed.

**Cryotherapy group**

11.5cm x 16.5cm of plastic bag filled with ice chip was applied to a cervical area after wrapping it with a towel(14). To maximize the effects of cryotherapy, we put an ice bag on the neck area of a patient who was in a prone position for 20 minutes(26).

**RESULTS**

This study has examined the effects of myofacial release and cryotherapy on the cervical pains and posture of acute whiplash patients who have experienced car accidents. The results are as follows.

**Cervical Pain**

To examine the changes in pains on the neck area, we carried out VAS and the results were shown in Table 1. Subject 1 reported that the pain was reduced from 8.12cm to 4.87cm after the treatment while subject 2 from 6.02cm to 4.31cm. Subject 3 was reported to have reduced pain to 3.15cm from 8.50cm. The average VAS was reduced by 4.39cm from 7.54cm to 4.11cm, which suggests that the myofacial release and cryotherapy have a positive effect in reducing pains.

**Table 1.** Changes in pain in cervical area (Unit : cm)

Subject	Pre	Post
1	8,12	4,87
2	6,02	4,31
3	8,50	3,15
Mean±SD	7.54±1.33	4.11±0.87

**Cervical Alignment**

**Cervical curvature**

The results of cervical curvature measure on the side through autoradiography were suggested in Table 2. Average cervical curvature was increased from 23.62° to 29.76°; subject 1 from 23.26° to 30.08°, subject 2 from 26.53° to 32.27° and subject 3 from 21.07° to 26.93°. Particularly, subject 1 and 2 were improved in a normal range.

**Table 2.** Changes in cervical curvature (Unit : ° )

Subject	Pre	Post
1	23,26	30,08
2	26,53	32,27
3	21,07	26,93
Mean±SD	23.62±2.74	29.76±2.68

**Cervical line of gravity**

Cervical line of gravity was measured on the side through autoradiography. The value of line of gravity increased as the head was placed in front of C7. The results of this research were shown in Table 3. The line of gravity of all subjects were reduced, indicating that the arrangement of cervical vertebra was improved, though there were differences between subjects; subject 1 from 7.57mm to 4.20mm, subject 2 from 3.38mm to 0.36mm and subject 3 from 13.15mm to 6.42 mm.

**Table 3.** Changes in cervical line of gravity (Unit : mm)

Subject	Pre	Post
1	7,57	4,20
2	3,38	0,36
3	13,15	6,42
Mean±SD	8.03±5.88	3.66±3.06

## DISCUSSION

Whiplash injury is caused when there is a sudden movement on the head against chest, which damages internal tissues or nerves on the spine(28). This damage can cause neck pain, shoulder weakness dizziness, headache(1). The purpose of research is to study the effect of MFR and cryotherapy on the cervical pain and alignment in acute whiplash injury patients.

To find out the level of pain, VAS was used. It has been confirmed that myofascial release and cryotherapy have a positive effect on reducing pain; pain was reduced from  $7.54 \pm 1.33$ cm to  $4.11 \pm 0.87$ cm, though there were personal differences.

The another research(8) suggested the similar results: when he applied myofascial release, mobilization of joint, McKenzie's movement therapy to cervical fascia pain syndrome patients, those who have been applied with myofascial release was increased most significantly at pain threshold, though the subjects were different. However, the another research(29) was divided patients into myofascial release group and taping group. While pains of the two groups were reduced, a group applied with taping showed better results which suggests that taping is more effective on pains, though myofascial release has a positive impact. This indicates that there needed more various approaches for whiplash patients.

To examine the state of cervical alignment, cervical curvature and line of gravity were analyzed through autoradiography. The average cervical curvature of the subjects were increased from  $23.62 \pm 2.74^\circ$  to  $29.76 \pm 2.68^\circ$ , indicating a positive effect of myofascial release and cryotherapy on the improvement of cervical curvature of the acute whiplash patients. In particular, cervical curvature of subject 1 and 2 were improved to be a normal range. Cervical curvature of subject 3 was improved from  $1.07^\circ$  to  $26.93^\circ$ . Even though it was not a normal range:  $30 \sim 35^\circ$ (25), it was a huge improvement for one week, indicating the possibility of being improved if the treatment is extended.

Line of gravity of subjects was changed from  $8.03 \pm 5.88$ mm to  $3.66 \pm 3.06$ mm. All participations recorded an overall reduce on the line of gravity. Increased value of line of gravity suggests the frontal part of the head, indicating the shortened muscles on the back of the neck and the movement of cervical vertebra(30). This kinds of frontal posture increases cervical curvature which can increase the distance between the axis of rotation of the spine to center of

mass of the head. This makes excessive works by cervical extensor(31). Thus, in this paper, decreased value of line of gravity means that the position of the head was moved from the front to the middle and that cervical myofascial release and cryotherapy have a positive effect on the changes of the head position of whiplash patients. The another research(26) were divided people with neck pain into two groups and applied myofascial release and infrared rays. They reported that myofascial release had more positive effect on the range of joint movement. However, we have not been able to examine the effect of cryotherapy on the posture arrangement in previous studies. Therefore, the limitation of this study is that it cannot suggest the individual effect of myofascial release and cryotherapy since they both were applied to acute whiplash injury patients simultaneously. Therefore we need to further look at the individual effect and various approaches for acute whiplash patients.

## CONCLUSION

This study has examined the changes in cervical pain and alignment when applying myofascial release and cryotherapy to acute whiplash patients for one week. To find out changes in cervical alignment, cervical curvature and line of gravity were measured. Pain was reduced after the treatment. In terms of alignment, cervical curvature was increased while line of gravity was reduced. Based on the results above, we concluded that myofascial release and cryotherapy are effective on acute whiplash patients.

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