Comparison on effectiveness of nerve mobilization and Kinesio Taping toward changes in Carpal Tunnel syndrome

Ike Ratih Kurniawti1, Mulyadi1, Hikmawaty Hasbia1
1Physiotherapy Study Program, Faculty of Medicine, Hasanuddin University, Makassar

nurhikmawatyhasbia@med.unhas.ac.id

Abstract. Carpal Tunnel Syndrome (CTS) is cause of functional disorder and chronic pain in the wrist due to median nerve compression during the carpal tunnel due to pressure which exceeds capillary perfusion pressure resulting in microcirculation disorders and arising ischemic nerves and increased interfascicular pressure causes vasodilation of blood flow to the median nerve. The study aims to determine comparison of nerve mobilization and kinesio taping toward changes in Carpal Tunnel Syndrome. The study was used two group pretest-posttest design. The study samples were 20 sellers who met the inclusion criteria that divided into two groups included 10 samples with nerve mobilization and 10 samples with kinesio taping. In additions, the data was analysed Wilcoxon test with SPSS program. The result showed there was significant relationship between nerve mobilization and kinesio taping toward changes in CTS on the sellers.

1. Introduction
Carpal tunnel syndrome (CTS) is clinical condition that mainly classified by sensory impairment [1]. CTS is most common in work related peripheral neuropathy among person perform hand-intensive tasks [2]. An estimation of 20% of computer users suffered carpal tunnel syndrome [3]. In additions, more than third of CTS patients had undergone surgical treatment [4]. In American study, the CTS incidence is more prone in the women than men with 491 per 100,000 per year [5].

The CTS patients had suffered pain such as trauma, fibrosis durometer, visceral pain, rheumatoid arthritis, nerve entrapment caused ischemia on nerve tissues, increased intraneural pressure, nerve edema and disrupt blood supply that slowly damage the nerves. In additions, other symptoms includes numbness, tingling, muscle weakness especially during hand grip [6,7].

The pain from CTS is measures using Visual Analogue Scale (VAS). Nerve mobilization is one of nerve technique which aims to stimulate the integration mechanics and physiology of the nerve system. During median neuron occurs which affects the axoplasmic flow, nerve movement and connective tissue and nerve circulation by the pressure changes in the nervous system and dispersion of intraneural edema.

The kinesio taping has provide the stability and protection by limiting the wide range of joints and pain. The is modality of stabilizing injured muscles and joints and promotes blood circulation and lymphatic flow to reduce pain in the healing process without limiting body movements [8]. The study aims to determine comparison of nerve mobilization and kinesio taping toward changes in Carpal Tunnel Syndrome.
2. Methodology
The study was conducted in Keras subdistrict, regency of Kediri, East Java. The study was used pre experimental method with two group samples using pretest-posttest group design. The study population was all sellers in the Kediri regency, East Java. The samples were 20 sellers which met the inclusion criteria such as positive in CTS, cooperative in the study and willing to be respondents. The samples were divided into 2 groups included 10 samples were given nerve mobilization and 10 samples were given kinesio taping.

The data was collected through primary data based on patients medical record. The pain value was obtained using Visual Analogue Scale (VAS) during pretest and posttest and interpreted the respondent pain level. The data was analysed using Wilcoxon test with SPSS program. The Wilcoxon test to determine the effectiveness of nerve mobilization and kinesio taping toward changes in CTS. The data was presented in the table and narrative.

3. Result and Discussion

3.1. Result
In Table 1, 20 respondents were aged between 18 years old and 65 years old and no respondent aged over than 66 years and above. In additions, 20 female respondents and no male respondent involved in this study. Meanwhile, there were 14 respondents (70%) had suffered low pain in CTS and 6 respondents (30%) had suffered moderate pain in CTS.

Table 1. Respondent characteristic distribution.

| Characteristic | Frequency (n) | Percentage (%) |
|----------------|--------------|----------------|
| Age (years old) |              |                |
| 18-65           | 20           | 100            |
| 66-79           | 0            | 0              |
| 80-99           | 0            | 0              |
| Total           | 20           | 100            |
| Gender          |              |                |
| Male            | 0            | 0              |
| Female          | 20           | 100            |
| Total           | 20           | 100            |
| Pain level      |              |                |
| No pain         | 0            | 0              |
| Low pain        | 14           | 70             |
| Moderate pain   | 6            | 30             |
| Strong pain     | 0            | 0              |
| Total           | 20           | 100            |

In additions, 5 respondents (50%) had low pain and 5 respondents (50%) had moderate pain in CTS among samples in nerve mobilization treatment group during pretest. Meanwhile, 9 respondents (90%) had no pain and 1 respondent (10%) had low pain in CTS during posttest.

For kinesio taping treatment group, there were 9 respondents (90%) had low pain and 1 respondent (10%) had medium pain in CTS during pretest. In posttest, 9 respondents (90%) had no pain and 1 respondent (10%) had low pain level in CTS.
Table 2. Distribution of pain level with given nerve mobilization and kinesio taping.

| Pain level (Nerve mobilization) | Pretest | Percentage (%) | Posttest | Percentage (%) |
|--------------------------------|---------|----------------|----------|----------------|
| No pain                        | 0       | 0              | 9        | 90             |
| Low pain                       | 5       | 50             | 1        | 10             |
| Medium pain                    | 5       | 50             | 0        | 0              |
| Strong pain                    | 0       | 0              | 0        | 0              |
| Total                          | 10      | 100            | 10       | 100            |

| Pain level (Kinesio taping)    | Pretest | Percentage (%) | Posttest | Percentage (%) |
|--------------------------------|---------|----------------|----------|----------------|
| No pain                        | 0       | 0              | 9        | 90             |
| Low pain                       | 9       | 90             | 1        | 10             |
| Medium pain                    | 1       | 10             | 0        | 0              |
| Strong pain                    | 0       | 0              | 0        | 0              |
| Total                          | 10      | 100            | 10       | 100            |

In nerve mobilization treatment group, the Wilcoxon test showed there was influence of nerve mobilization toward changes in CTS, p=0.004<0.05. In additions, there also influence of kinesio taping toward changes of CTS in kinesio taping treatment group. Besides, the mean of nerve mobilization during pretest of 2.80 and decreased to 0.00 in posttest with moderate pain.

Table 3. Wilcoxon test result on nerve mobilization and kinesio taping toward changes in CTS.

| Sample group                        | N   | Mean±SD     | Z      | Sig (2-tailed) |
|-------------------------------------|-----|-------------|--------|----------------|
| Pretest (nerve mobilization)        |     |             |        |                |
| No pain                             | 10  | 0.00±0.00   |        |                |
| Low pain                            |     | 1.70±1.83   | -2.889a| 0.004          |
| Moderate pain                       |     | 2.80±2.97   |        |                |
| Strong pain                         |     | 0.00±0.00   |        |                |
| Posttest                            |     |             |        |                |
| No pain                             | 10  | 0.90±0.876  |        |                |
| Low pain                            |     | 0.00±0.95   |        |                |
| Moderate pain                       |     | 0.00±0.00   |        |                |
| Strong pain                         |     | 0.00±0.00   |        |                |

| Pretest (kinesio taping)            |     |             |        |                |
| No pain                             |     | 0.00±0.00   | -2.530a| 0.011          |
| Low pain                            |     | 3.33±0.50   |        |                |
| Moderate pain                       | 10  | 0.56±1.67   |        |                |
| Strong pain                         |     | 0.00±0.00   |        |                |

| Posttest                            |     |             |        |                |
| No pain                             | 10  | 0.00±0.00   |        |                |
| Low pain                            |     | 3.33±0.50   |        |                |
| Medium pain                         |     | 0.56±1.67   |        |                |
| Strong pain                         |     | 0.00±0.00   |        |                |
3.2. Discussion
The result found there was influence of nerve mobilization and kinesio taping toward the changes in CTS patients for at least months with significant value of 0.004 and 0.011 (p<0.05). The respondents were given nerve mobilization found the pain level in CTS according to VAS. Meanwhile, 8 respondents was experienced decrement in pain level of CTS and 2 respondents did not experience any changes in the CTS pain level according to VAS. These results were influenced by the wrist intensity and duration resulting in delayed healing process in the median nerves.

In additions, CTS patient will stimulate spindle muscles resulted of recurrence of Alpha and Beta receptors in the muscle spindle. The autonomic interaction reaction due to Alpha and Beta receptors stimulation which will released Ach in phoenicus nerve caused vasoconstriction sympathetic and released non-adrenaline (Cytokine interleukin-8 (IL-8) which lead to the acute hyper nociceptive.

The nerve mobilization plays a role in reducing pain with decrease the muscle tone enhancing sympathetic activity and reducing adhesive in the tissues which found in the CTS. The nerve mobilization with addition of active motion to the finger that helped to reduce the adhesive in the tissues.

The kinesio taping given on CTS condition that pull force to tendon or ligament. The strain of kinesio taping will increase afferent stimulus to the large diameter nerve fibers and reduce the impulse received from small diameter nerve fiber through nociceptive. The nerve mobilization and kinesio taping had an effect in decreased pain of CTS conditions. However, nerve mobilization had more significant effect in decreased in CTS pain level than kinesio taping.

4. Conclusion
In conclusion, there was effect of giving nerve mobilization and kinesio taping toward changes in CTS with significant value of 0.004 and 0.011. Besides, there was more significant effect on nerve mobilization than kinesio taping in reducing the CTS pain. The study is expected to utilize other method to understand influence of nerve mobilization and kinesio taping in reducing pain level caused by CTS and need to be reviewed about factors that will influence the study result.

References
[1] S Setayesh, M., Zargaran, A., Sadeghifar, A. R., Salehi, M., & Rezaeizadeh, H. (2018). New candidates for treatment and management of carpal tunnel syndrome based on the Persian Canon of Medicine. Integrative Medicine Research, 7(2018), 126-135.
[2] You, D., Smith, A. H., & Rempel, D. (2014). Meta-analysis: association between wrist posture and carpal tunnel syndrome among workers. Safety and Health at Work, 5(2014), 27-31.
[3] Loh, P. Y., & Muraki, S. (2015). Effect of wrist angle on median nerve appearance at the proximal carpal tunnel. PLoS ONE, 10(2), e0117930.doi: 10.1371/journal.pone.0117930
[4] Atroshi, I., Zhou, C., Jöud, A., Petersson, I. F., & Englund, M. (2015). Sickness absence from work among persons with new physician-diagnosed carpal tunnel syndrome: a population-based matched-cohort study. PLoS ONE, 10(3), e0119795.
[5] Fnais, N., Gomes, T., Mahoney, J., Alissa, S., & Mamdani, M. (2014). Temporal trend of carpal tunnel release surgery: a population-based time series analysis. PLoS ONE, 9(5), e97499.
[6] Modi, C. S., Ho, K., Hegde, V., Boer, R., & Turner, S. M. (2010). Diagnosis of motor fascicle compression in carpal tunnel syndrome. Orthopaedics and Traumatology: Surgery and Research, 96, 485-489.
[7] Bakhtiyari, A. H., & Rashidy-Pour, A. (2004). Ultrasound and laser therapy in the treatment of carpal tunnel syndrome. Australian Journal of Physiotherapy, 50,147-151.
[8] Shacklock, M. (2005). Clinical neurodynamics (Toronto; Saunders Elsevier)