Indonesian Journal of Medicine (2024), 09(01): 118-123
Masters Program in Public Health, Universitas Sebelas Maret

Research
Open Access

Effect of Nerve Mobilization in Reducing Pain in Patients with Guyon Canal Syndrome

Dita Maliesgasari, Wahyu Tri Sudaryanto

Study Program of Physiotherapy, Faculty of Health Sciences,
Universitas Muhammadiyah Surakarta

Received: 17 November 2022; Accepted: 28 December, 2023; Available online: 10 January, 2024

ABSTRACT

Background: Guyon Canal Syndrome is a peripheral ulnar neuropathy caused by lesions of the distal ulnar nerve, specifically in the Guyon's tunnel which is at the base of the hypothenar eminence where the ulnar nerve branches and is susceptible to compression. These tunnel structures are frequently subject to cycling-related injuries, sudden compression or repetitive vibration. Guyon Canal Syndrome causes loss of motor, sensory function, or a combination of motor and sensory function. The aim of this research is to determine the effect of nerve mobilization on reducing pain in Guyon Canal Syndrome.
Subjects and Method: This research is a quasi-experimental research conducted at the Grhasia Mental Hospital, Yogyakarta Special Region, in June-July 2023. A total sample of 8 patients diagnosed with Guyon canal syndrome was selected using purposive sampling. The sample was divided into 2 groups (1) 4 people received nerve mobilization and (2) 4 people received standard care. The dependent variable is pain. The independent variable is nerve mobilization. Pain was measured using the Quadruple Visual Analogue Scale (QVAS). The difference in pain scores before and after intervention in the two groups was tested using an independent t test.
Results: The average difference in pain score reduction in the intervention group (Mean= -11.75; SD= 5.68) was greater than the control (Mean= -3.5; SD= 11.39), but not statistically significant (p= 0.242).
Conclusion: The average difference in pain score reduction in the intervention group was greater than the control, but not statistically significant.

Keywords: guyon canal syndrome, pain, nerve mobilization

Correspondence:
Dita Maliesgasari. Study Program of Physiotherapy, Faculty of Health Sciences, Universitas Muhammadiyah Surakarta. Jl. A. Yani, Pabelan, Kartasura, Sukoharjo, Central Java 57169 Indonesia. Email: maliesgasari17@gmail.com. Mobile: +6281329084148.

Cite this as:
Maliesgasari D, Sudaryanto WT (2024). Effect of Nerve Mobilization in Reducing Pain in Patients with Guyon Canal Syndrome. Indones J Med. 09(01): 118-123. https://doi.org/10.26911/theijmed.2024.09.01.14.

© Dita Maliesgasari. Published by Master's Program of Public Health, Universitas Sebelas Maret, Surakarta. This open-access article is distributed under the terms of the Creative Commons Attribution 4.0 International (CC BY 4.0). Re-use is permitted for any purpose, provided attribution is given to the author and the source is cited.

BACKGROUND

The hand is one of the means of movement in the human body which has a structure that is quite unique and different from other parts of the body. Hand movements are gross motor and fine motor. Both have their respective functions, both of them play an important role in various activities such as eating, holding, and even working (such as typing on a computer, using a cell phone, driving, cycling and so on) (Hadders-Algra, 2018). Therefore, if an injury or injury

occurs to the hand, it will greatly interfere with movement and carrying out important activities, which can affect the patient's quality of life (Zeeshan et al., 2009).

One of the injuries that occurs to the hand is Guyon Canal Syndrome. This syndrome, which irritates the distal peripheral ulnar nerve, is located in the wrist area, where the ulnar nerve is located. The ulnar nerve is one of the main nerves of the hand that runs down the neck, passing through the underside of the forearm muscles along the side of the palm to the little finger (Aleksenko et al., 2018). Guyon's canal syndrome is also known as ulnar tunnel syndrome, handlebar palsy or cyclist's palsy (Brown et al., 2014). The term ulnar tunnel syndrome was proposed by Dupont and colleagues in 1965 and named Guyon's tunnel after the French surgeon Jean Casimir Felix Guyon described it in 1861 (Fadel et al., 2017).

Guyon described the space at the base of the hypothenar eminence where the ulnar nerve branches and is susceptible to compression (Bachoura et al., 2012). These tunnel structures are often subject to injuries related to cycling, sudden compression or repetitive vibration (Kopcik, 2023). From research conducted on industrial populations in Australia of at least 150 cases of Hypothenar Hammer Syndrome, which is one of the causes of Guyon Canal Syndrome, it was reported that 14% of the prevalence of this condition is estimated to occur in at-risk populations (manual laborers and hand workers), and 1.1-1 .6% of patients present with hand vein problems (Rai et al., 2021).

Guyon Canal Syndrome disorders can be pure sensory disorders, pure motor disorders or a combination of both depending on the location of the nerve compression. Peripheral nerves can be injured in various ways, sometimes there is discomfort or radiating pain as a manifestation of stimulation of the sensory nerves. Nerve pain is sometimes felt along the course of the peripheral nerve (Khajeh et al., 2021). A prospective study by Patterson et al. (2003), randomly investigated the incidence of ulnar neuropathy in cyclists. Of 25 cyclists (aged 20-60 years), who underwent a bicycle tour of 600 km over four days. As a result, 70% of participants experienced some form of neurological symptoms at the end of the trip. Motor weakness was experienced by 36% of participants, sensory loss was seen in 10% of participants, and 25% experienced both disorders. Other results from this study showed there was no difference between experienced cyclists compared to inexperienced cyclists in terms of symptoms, and 9 mountain bikers had more sensory loss when compared to participants on road bikes (Brown et al., 2014).

Slane et al. (2011) investigated the effect of gloves and hand position on pressure on the ulnar nerve during cycling. The study assessed 36 experienced cyclists on trips of up to one to two hours, consisting of an equal number of men (40.2 y, 180 cm, 82 kg) and women (37 y, 170 cm, 80 kg). Handlebar pressure was measured using a high resolution pressure mat (peizo capacitive pressure mat), type of glove (foam, gel) and glove thickness (3mm, 5mm), the results of this research are that ulnar nerve damage in the Guyon Tunnel can be minimized by 10-29%, with precautions such as frequently changing hand positions and ensuring correct bicycle positioning by a professional, wearing thin padded gloves (3 mm, foam) (Brown et al., 2014).

In addition to these preventive measures, nerve mobilization is a manipulative technique in which nerve tissue is moved and stretched either by movement relative to its surroundings or by the development of tension. This technique aims to reduce or even eliminate clamping and

pressure on the nerves, so that radicular pain can also be reduced. Research (Ellis et al., 2008) on the effectiveness of nerve mobilization against pathology in the nervous system, concluded that nerve mobilization is recommended for the treatment of neurodynamic dysfunction. To date the justification for the use of nerve mobilization has been based on several clinical trials and evidence as well as its positive therapeutic benefits. However, in consideration of methodological quality, qualitative analysis of the study revealed that there was only limited evidence to support the use of nerve mobilization.

There is not much evidence based on nerve mobilization, in general nerve mobilization is useful in entrapment or entrapment and compression syndrome, which can cause changes in nerve tissue including decreased mobility, increased mechanosensitivity, decreased nerve conduction, nerve ischemia, inhibition of axonal transport, and intraneural edema (Gilbert et al., 2015) especially those occurring in the upper extremities, cervico-brachial and lumbosacral.

SUBJECTS AND METHOD

1. Study Design

This was a quasi-experimental study conducted at the Grhasia Mental Hospital, Yogyakarta, from June to July 2023.

2. Population and Sample

A total sample of 8 Guyon canal syndrome patients was selected using purposive sampling. Patients with neurological diseases (cervical root syndrome, TOC, or stroke) or who were taking pain medication were excluded.

3. Study Variables

The dependent variable is pain. The independent variable is nerve mobilization..

4. Operational Definition of Variables

Nerve mobilization is a neurodynamic technique in the form of examination, evaluation and treatment, and can also be used as a diagnosis of the mechanics and physiology of the nervous system which are related to each other and integrated with musculoskeletal function. Nerve mobilization is performed three times per week. Each session provided four sets of 10 repetitions, a cadence of 6 seconds per cycle, and a rest period of 1 to 2 minutes between sets (Mateus et al., 2020). Pain is an unpleasant sensory and emotional experience resulting from tissue damage, either actual or potential or described in terms of such damage. Pain was measured with Quadruple VAS (Mbada et al., 2021).

5. Data analysis

The difference in pain scores before and after intervention in the two groups was tested using an independent t test.

6. Research Ethics

This research was supported by an ethical permission letter, including informed consent, and confidentiality signed during the research process. The ethical permission letter for this research was obtained from the Research Ethics Committee Educational Installation at the Grhasia Mental Hospital No.26/EC-KEPKRSJG/-VI/2023.

RESULTS

1. Univariate Analysis

Two-third of the study subjects were female (62.5%) (Table 1). After interventio, pain score (Mean= 45.88; SD= 6.99) was lower than before (Mean= 53.5; SD= 8.73) (Table 2). The average difference in pain score reduction in the intervention group (Mean= -11.75; SD= 5.68) was greater than the control (Mean= -3.5; SD= 11.39), but not statistically significant (p= 0.242) (Table 3).

Table 1. Gender distribution

Gender	N	%
Male	3	37.5%
Female	5	62.5%

Table 2. Mean distribution of pain score before and after intervention

Pain score	n	Mean	SD	Min.	Maks.
Before	8	53.5	8.73	43	66
After	8	45.88	6.99	33	53

2. Bivariate Analysis

Table 3. Mean difference of pain score between groups, before, and after intervention

Group	N	Mean	SD	p
Control	4	-3.5	11.39	0.242
Intervention	4	-11.75	5.68	

DISCUSSION

Guyon Canal Syndrome is a compression neuropathy from entrapment of the ulnar nerve at the wrist which causes loss of motor, sensory or combined motor and sensory function (Ozdemir et al., 2011). Guyon canal syndrome nerve compression can cause motor or sensory dysfunction affecting the IV and V fingers and the hypothenar area (Kopcik et al., 2023). When symptoms occur in cyclists, the condition is described as handlebar paralysis (damage caused by long-distance cycling) as a result of repetitive vibrations and bearing body weight on the wrists and hands.

Nerve mobilization aims to restore full movement without complaints of pain (pain free movement). Nerve mobilization is very helpful in increasing axonal transport to improve nerve conduction so that the pressure inside the nerve is reduced and can result in increased blood flow to the nerve. As a result, regeneration and healing of injured nerves can also occur (Vikranth et al., 2015). Nerve mobilization can reduce or even eliminate clamping and pressure on the nerve, so that radicular pain can also be reduced (Shacklock, 2005). Through this technique, it is possible that damage to the nerves will be reduced, pain reduced, Range of Motion (ROM) increased, the dynamic adaptability of the nervous system increased so that it can improve the patient's functional abilities (Khadijah and Budi, 2020).

The principle of nerve mobilization is stretching of nerve tissue based on the mechanosensitivity system, which is a mechanism that allows nerves to produce pain with movement. If a nerve is not mechanically sensitive, it will not respond (cause pain) to mechanical forces applied to it. Mechanosensitivity can be defined as the excitatory impulses that can be activated from a nervous system when a mechanical force is applied to it (Brotzman and Novotny, 2018).

The results of this study showed that the difference in reducing pain scores in the group given nerve mobilization was greater than in the control group, but was not statistically significant. This is possible because of the small sample. Guyon's canal syndrome is a relatively rare peripheral ulnar neuropathy that involves injury to the distal portion of the ulnar nerve as it passes through a narrow anatomical corridor at the wrist. Other studies state the need for

additional treatment to overcome this problem, ultrasound therapy, nerve gliding exercises, even surgery if necessary (Aleksenko and Varacallo, 2023). Sudhagar and Le Blanc (2012) explained that providing an ulnar nerve gliding program, ultrasound 3 times a week for 10 weeks and using an anticlaw hand splint in patients diagnosed with Guyon canal syndrome was able to restore the sensory response of the little finger and eliminate Froment's and Duchenne's signs.

AUTHOR CONTRIBUTION

Dita Maliesgasari acted as the main researcher who prepared the research plan, collected data, and carried out data analysis. Wahyu Tri Sudaryanto interpreted the research results, compiled a table of analysis results. Dita Maliesgasari and Wahyu Tri Sudaryanto together drafted the manuscript. All authors have read the final manuscript and approved it for publication.

FINANCIAL SUPPORT AND SPONSORSHIP

This study is self-funded.

ACKNOWLEDGEMENT

Researchers would like to thank RSJ Grhasia Yogyakarta Special Region.

CONFLICT OF INTEREST

There is no conflict of interest in this study.

REFERENCE

Aleksenko D, Varacallo M (2018). Guyon Canal Syndrome. In: StatPearls. Treasure Island (FL): StatPearls Publishing. https://www.ncbi.nlm.nih.gov/books/NBK431063/.

Bachoura A, Jacoby SM (2012). Ulnar Tunnel Syndrome. Orthop Clin North Am. 43(4): 467–474. doi: 10.1016/j.ocl.2012.07.016.

Brotzman SB, Novotny SR (2018). Nerve Compression Syndromes. Clinical orthopaedic rehabilitation: a team approach (Fourth Edition). 32-41.e1. doi:10.1016/B978-0-323-39370-6.00007-X.

Brown CK, Stainsby B, Sovak G (2014). Guyon Canal Syndrome: lack of management in a case of unresolved handlebar palsy. J Can Chiropr Assoc. 58(4): 413-420. https://pubmed.ncbi.nlm.nih.gov/25550666.

Ellis RF, Phty B, Dip G, Hing WA (2008). Neural mobilization: A systematic review of randomized controlled trials with an analysis of therapeutic efficacy J Man Manip Ther. 16(1): 8-22. doi:10.1179/106698108790818594.

Fadel ZT, Samargandi OA, Tang DT (2017). Variations in the anatomical structures of the guyon canal. Plastic Surg. 25(2), 84–92. doi: 10.1177/229255031769485 1.

Gilbert KK, James CR, Apte G, Brown C, Sizer PS, Brismée JM, Smith MP (2015). Effects of simulated neural mobilization on fluid movement in cadaveric peripheral nerve sections: Implications for the treatment of neuropathic pain and dysfunction. J Man Manip Ther. 23(4): 219–225. doi:10.1179/2042618614Y.0000000094.

Hadders-Algra M (2018). Early human motor development: From variation to the ability to vary and adapt. Neurosci Biobehav Rev. 90: 411-427. doi:10.1016/j.neubiorev.2018.05.009.

Khadijah S, Budi IS (2020). Efektivitas Neural Mobilization Terhadap Peningkatan Aktivitas Dan Kemampuan Fungsional Pada Ischialgia (Effectiveness of Neural Mobilization in Increasing Activity and Functional

Ability in Ischialgia). 1(1), 6–16. doi: 10.23917/jurnal.fisiomu.v1i1.9394.

Khajeh R, Farzan M, Jamshidi SMMM, Moharrami A (2021). Guyon Canal Syndrome Due to Schwannomas of Zone 3 Ulnar Nerve without Neurologic Symptoms: A Case Report. Arch Bone Jt Surg. 9(5): 598–600. doi: 10.22038%2Fabjs.2020.50869.2520.

Kopcik K (2023). Guyon Canal Syndrome and handlebar palsy – summary of available knowledge. J Pre-Clin Clin Res. 17(1), 23–26. doi:10.26444/-jpccr/159709.

Mateus A, Rebelo J, Silva AG (2020). Effects of a multimodal exercise program plus neural gliding on postural control, pain, and flexibility of institutionalized older adults: A randomized, parallel, and double-blind study. J Geriatr Phys Ther. 43(1): 3–11. doi: 10.1519/JPT.0000000000-00249.

Mbada C, Akindele F, Fatoye C, Ademoyegun A, Odole A, Ogunlana M, Idowu A, Adegbemigun O, Fatoye F (2021). Translation and psychometric evaluation of the yoruba version of quadruple visual analogue scale. Ann Ig. 33(5):443-455. doi:10.4103/njhs.njhs_4_20.

Ozdemir O, Calisaneller T, Gulsen S, Caner H (2011). Ulnar nerve entrapment in guyon's canal due to recurrent carpal tunnel syndrome: Case report. Turk Neurosurg. 21(3): 435–437. doi:10.5137/1019-5149.JTN.2959-10.1.

Patterson JMM, Jaggars MM, Boyer MI (2003). Ulnar and median nerve palsy in long-distance cyclists. A prospective study. Am J Sports Med. 31(4): 585-9. doi:10.1177/03635465030310041801.

Rai G, Kamath GS, Kavirayani V, Bishnoi AK, Reddy R (2021). A rare case of hypothenar hammer syndrome triggering guyon's canal syndrome. J Clin Diagn Res. 15(3): 7-8. doi:10.7860/jcdr/2021/46951.14658.

Shacklock M (2005). Improving application of neurodynamic (neural tension) testing and treatments: A message to researchers and clinicians. Man Ther. 10(2): 175–179. doi:10.1016/j.math.2005.03.001.

Slane J, Timmerman M, Ploeg HL, Thelen DG (2011). The influence of glove and hand position on pressure over the ulnar nerve during cycling. Clin Biomech (Bristol, Avon). 26(6): 642-8. doi:10.1016/j.clinbiomech.2011.03.003.

Sudhagar G, Le Blanc M (2012). Conservative management of ulnar tunnel syndrome: secondary to excessive healing tissue; a rare complication after flexor tendon injury-a case report. Tech Hand Up Extrem Surg. 16(2):64-6. doi:10.1097/bth.0b013e31823f06f6.

Vikranth GR, Vinod KKC, Mathias L (2015). Comparative effect of carpal bone mobilization versus neural mobilization in improving pain, functional status and symptoms severity in patients with carpal tunnel syndrome. Int J Physiother. 2(3). doi:10.15621/-ijphy/2015/v2i3/67025.

Zeeshan M, Ahmed F, Kanwal D, Khalid QSB, Ahmed MN (2009). Guyon's canal syndrome due to tortuous ulnar artery with DeQuervain stenosing tenosynovitis, ligamentous injuries and dorsal intercalated segmental instability syndrome, a rare presentation: a case report. Cases J. 2: 9390. doi:10.1186%2F1757-1626-2-9390.