Different Effect of Lateral Glide Mulligan and Ventral Glide Kaltenborn on Changes in Lumbal Range of Motion and Functional Capacity on Chronic Low Back Pain

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ABSTRACT

Chronic low back pain is pain that lasts more than 12 weeks and occurs repeatedly, causing limitation of lumbar Range of Motion (ROM) and decreased functional capacity. A quasi-experimental study with a randomized pre test - post test two group design, knowing the difference in effectiveness between the combination of Microwave Diathermy (MWD) and Lateral Glide Mulligan or Ventral Glide Kaltenborn in Chronic Low Back Pain randomized into 2 groups, namely group of I given MWD and Lateral Glide Mulligan and group of treatment II were given MWD and Ventral Glide Kaltenborn. Analysis of paired sample t test in the treatment data group I obtained p value = 0.038 flexion, p value = 0.000 extension, p value = 0.025 lateral flexion, and p value = 0.003 FTSTS. Treatment data group II obtained p value = 0.000 flexion, p value = 0.030 extension, p value = 0.015 lateral flexion, and p value = 0.045 FTSTS. In the data above, treatments I and II showed a significant effect of the combination of Microwave Diathermy (MWD) and Lateral Glide Mulligan or Ventral Glide Kaltenborn. Then, independent t test obtained p value = 0.705 flexion, p value = 0.333 extension, p value = 0.657 lateral flexion, and p value = 0.451 FTSTS, meaning there was no significant difference between treatment group I and treatment group II. The conclusion of this study is that the combination of MWD and Lateral Glide Mulligan is not more effective than the combination of MWD and Ventral Glide Kaltenborn on changes in lumbar ROM and functional capacity in patients with chronic low back pain.

Keywords: *Microwave Diathermy (MWD), Lateral Glide Mulligan, Ventral Glide Kaltenborn, Chronic Low Back Pain.*

INTRODUCTION

When performing movements in everyday life, humans do not only use the lower limbs, but also involve involvement to support body weight. Sitting and other static activities often put weight on the waist as a focus. This causes a large support load on the waist when humans are active in daily life. Lack of awareness of body posture can make performance heavy on the waist, causing abnormalities. The impact of all that appears pain in the waist area which is commonly called lower back pain or lower back pain.

According to the course of the disease, low back pain consists of acute low back pain and chronic low back pain. Acute low back pain is a history of pain that the patient feels for the first time in his life, or an interval of pain free for 6 months, and lasts no more than 6 weeks (Casser et al., 2016). Chronic Low Back Pain abbreviated as CLBP or chronic low back pain is a chronic pain syndrome in the lower back area, lasting for at least 12 weeks. Many authors suggest defining chronic pain as pain that persists beyond the normal healing period. CLBP represents a leading cause of disability worldwide and is a major problem in welfare and the economy. Given this complexity, the diagnostic evaluation of patients with CLBP can be very challenging and requires complex clinical decision making (Allegri et al., 2016).

Chronic Low Back Pain (CLBP) is experienced by 60% -80% of people. Andersson estimates the annual worldwide incidence of CLBP in adults to be around 15% with a prevalence of 30% (Ganesan et al., 2017). In Europe, population-based surveys have shown that chronic low back pain ranges between 18% and 24% (Husky et al., 2018).

The prevalence of Chronic Low Back Pain in Indonesia reaches 18-29% (Purwata et al., 2014). Epidemiological data regarding LBP in Indonesia does not yet exist, but the incidence based on patient visits from several

hospitals in Indonesia ranges from 3-17%. Reporting from the Medical Rehabilitation Siloam Hospital Makassar Database, there are 60% cases of chronic low back pain out of a total of 573 cases of low back pain from October to November 2020.

This research was conducted at Siloam Hospital Makassar with the consideration that Chronic low back pain is included in the 10 most cases at Medical Rehabilitation Siloam Hospital Makassar, and is in the first level of the 10 most cases. Chronic low back pain generally occurs due to a history of repeated low back pain. The existence of a history of low back pain can cause changes in posture in the lumbar and pelvic, this has an impact on the hypomobile sacroiliac joint (SIJ) such as pain or blockade which in turn causes referred pain to the buttocks area and decreased lumbar range of motion. Another impact caused by the International Statistical Classification of Diseases and Related Health Problems (ICD), sacroiliac joint blockade is classified into the category of disorders that occur in the sacrum (ICD-9 CM 724.6 or ICD-10 CM 53.3).

Meanwhile, the International Classification of Functioning, Disability, and Health (ICF) classifies each pathology into three groups of impairments, namely body function, body structure and activities and participation limitations. Impaired body functions due to sacroiliac joint blockade include sensitivity to noxious stimuli, namely pain and discomfort (ICF code b2703). Where pain is especially felt in the sacroiliac joint (b28016). Sacroiliac joint blockade also affects mobility impairments (b710) in both one and both sacroiliac joints. The main body structure that is affected by the sacroiliac joint is the pelvic joint (ICF code s7401).

It will also have a direct impact on the functional capacity of the body's activities and participation when completing daily routines (ICF code d2303), changing and maintaining body positions including lying down, sitting, squatting, standing (d429), long walks (d4501), running (d4552), jumping (d4553), driving (d4751), toilet activity (d5308), exercise (d5701), doing housework (d649), worshiping (d9309), working (d859) including sex (d770).

Many of the sufferers of chronic low back pain at Siloam Hospital Makassar feel pain when the SIJ pain provocation test is carried out. Some of the modalities that can be given to CLBP are Microwave Diathermy (MWD), manual therapy in the form of Mulligan mobilization and Kaltenborn mobilization.

Heat therapy has long been used in the treatment of CLBP, one of which is Microwave Diathermy (MWD). MWD is a thermal modality that can convert electromagnetic energy into heat energy. Thermal energy is generated by increasing the kinetic energy of molecules (Durmus et al., 2014). Thermal energy can produce changes in the extensibility of soft tissues which can cause a decrease in muscle spasm, relaxation and changes in muscle length, thereby increasing range of motion and increasing functional capacity.

The concept of mobilization with mobilization with movement is a specialized manual therapy technique that has been developed to restore normal arthrokinematic and osteokinematic movements. This therapeutic intervention combines pain-free accessory mobilization with active and/or passive physiological movements (Pourahmadi et al., 2018).

One of the interventions of Mulligan's mobilization with movement is lateral glide. This technique helps to improve the limited mobility of the sacroiliac joint in patients with

chronic low back pain. The direction of the lateral glide force can be varied to produce the best results. This technique can be easily taught to others so it can be done at home (Wayne Hing et al., 2019). Increased mobility in the SIJ will have an impact on increasing lumbar ROM and improving functional capacity.

One of the interventions of Mulligan's mobilization with movement is lateral glide. This technique helps to improve the limited mobility of the sacroiliac joint in patients with chronic low back pain. The direction of the lateral glide force can be varied to produce the best results. This technique can be easily taught to others so it can be done at home (Wayne Hing et al., 2019). Increased mobility in the SIJ will have an impact on increasing lumbar ROM and improving functional capacity.

Kaltenborn's ventral glide mobilization is one of the interventions to correct problems with the sacroiliac joint. Mobilization of the ventral glide as a means of evaluation and treatment and to improve the stiffness that accompanies improvement in function. Careful and comprehensive examination is a prerequisite for the application of this technique (Ahmed et al., 2018). Ventral glide mobilization has been shown to be superior in reducing pain and increasing lumbar extension which results in better functional outcome (Shah & Kage, 2016). Improvement of joint stiffness will overcome the limitations of ROM in the lumbar and the pain-reducing effect of this technique can improve functional capacity.

Based on the description of the problem above, the researchers are interested in empirically proving the effects of lateral glide mobilization and ventral glide mobilization on chronic low back pain conditions.

MATERIAL AND METHOD

The aims of this study was to determine the different effects between the combination of MWD and lateral glide mobilization (Mulligan) with MWD and ventral glide mobilization (Kaltenborn) on changes in Range of Motion (ROM) and functional capacity in patients with chronic low back pain, so that based on these objectives, the type of this research is a quasi-experimental with a randomized pretest - posttest two group design.

This research was conducted at Siloam Hospital Makassar from April to May 2021. The population of this study were all chronic low back pain sufferers who received physiotherapy services at the Medical Rehabilitation Siloam Hospital Makassar. The sampling technique used is simple random sampling.

Inclusion criteria were patients with chronic low back pain, based on the physiotherapy assessment (limited ROM in extension - lateral flexion, positive on the Gillet test, positive on mobilization of the sacrum test, tenderness in the SIPS area when palpated, and willing to be research respondents until finish. Exclusion criteria were patients with chronic low back pain who had radicular symptoms, patients with chronic low back pain who had a history of lumbar and/or illium fractures, patients with chronic low back pain who had a history of internal disease, and patients with chronic low back pain who were taking analgetic.

MWD intervention with microwave modality applied to the back. The dose used is continuous MWD form, intensity of mild-moderate heating (50 watts), time of 15 minutes. Manual therapy lateral glide mobilization is a manual therapy method that applies passive lateral glide to the ilium accompanied by active movement of the

patient's trunk extension. The dose used is 10 repetitions in one set, performed 3 sets in one therapy session.

Manual therapy ventral glide mobilization which is a manual therapy method that is applied to the ilium passively by pushing the ilium forward when the patient is in the prone position. The dose used is 10 repetitions in one set, performed 3 sets in one therapy session.

Range of Motion (ROM) or the range of motion of the lumbar joints as measured using a bubble inclinometer. Includes lateral flexion, flexion, and extension movements. The object criteria are that ROM is categorized as increasing when the post-test ROM value is greater than the ROM result during the pre-test, ROM is categorized as decreasing when the pre-test ROM value is greater than the post-test ROM result, and ROM is categorized as constant when the pre-test ROM result. -test is the same as the ROM results at the post-test.

The measurement of functional capacity used the Five Times Sit-to-Stand Test (FTSTS). The object criteria are that the patient can perform a sitting to standing movement from a chair, the number of calculation times in each measurement session is reduced (according to the patient's ability), and it is carried out 1 time before and after therapy.

RESULT AND DISCUSSION

Table 1
Mean value Lumbar ROM and FTSTS

Sample groups	Mean dan Standard Deviation		
	Pre test	Post test	Difference
Group1			
Lumbar Fleksi	57,14±6,49	64,57±5,79	7,43±4,12
Lumbar Ekstension	31,29±8,08	37,29±9,99	6,00±2,65
Lumbar Lateral Flexion	14,00±3,32	21,43±4,69	7,43±2,76
FTSTS	20,00±2,83	14,57±2,82	5,43±1,13
Group 2			
Lumbar Fleksi	56,14±12,64	64,00±9,31	8,29±4,15
Lumbar Ekstension	26,86±5,08	35,14±5,24	7,71±3,64
Lumbar Lateral Flexion	18,57±6,93	27,29±6,87	8,29±4,15
FTSTS	19,86±3,34	15,43±2,57	4,86±1,57

Based on the table above, the data in the group 1 is obtained as follows:

1. Lumbar ROM value; MWD and Lateral Glide Mobilization Mulligan intervention increase ROM 7.43 degrees in lumbar flexion, ROM of lumbar extension by 6.00 degrees, and ROM of lateral lumbar flexion by 7.43 degrees.
2. Five Time Sit To Stand Value; MWD and Lateral Glide Mobilization Mulligan intervention can produce changes in ambulation speed (sitting to standing) of 5.43 seconds.

While the group 2 obtained the following data:

1. Lumbar ROM value: MWD and Ventral Glide Mobilization Kaltenborn intervention increase ROM of 8.29 degrees in lumbar flexion, ROM of lumbar extension of 7.71 degrees, and ROM of lateral flexion lumbar by 8.29 degrees.

2. Five Time Sit To Stand Value; MWD and Ventral Glide Mobilization Kaltenborn intervention can produce changes in ambulation speed (sitting to standing) of 4.86 seconds.

Table 2.
The difference mean value in group 1

Data group	Pre test	Post test	t	p
Lumbar Fleksi				
Mean	57,14	64,57	-4,774	0.038

SD	6,49	5,79		
Lumbar Ekstension				
Mean	31,29	37,29	-6,000	0,000
SD	8,077	9,995		
Lumbar Lateral Flexion				
Mean	14,00	21,43	-7,120	0,025
SD	3,317	4,685		
FTSTS				
Mean	20,00	14,57	-12,667	0,003
SD	2,828	2,820		

Based on the table above, the results of the paired sample t test are p value < 0.05 for all ROM and Five Time Sit To Stand, which means that the MWD and Lateral Glide Mobilization Mulligan intervention can provide changes in lumbar ROM (flexion, extension, lateral flexion) and functional capacity (Five Time Sit To Stand) which is significant in chronic low back pain conditions.

Tabel 3.
The difference mean value in group 2

Data group	Pre test	Post test	t	p
Lumbar Fleksi				
Mean	56,14	64,00	-5,070	0.000
SD	12,642	9,309		
Lumbar Ekstension				
Mean	26,86	35,14	-6,742	0,030
SD	5,080	5,242		
Lumbar Lateral Flexion				
Mean	18,57	27,29	-7,120	0,025
SD	6,925	4,685		
FTSTS				
Mean	19,86	15,43	5,452	0,003
SD	3,338	2,573		

Based on the table above, the results of the paired sample t test are p value < 0.05 for all ROM and Five Time Sit To Stand, which means that the MWD and Ventral Glide Mobilization Kaltenborn intervention can provide changes in lumbar ROM (flexion, extension, lateral flexion) and functional capacity (Five Time Sit To Stand) which is significant in chronic low back pain conditions.

Table 4.
The difference mean value between groups 1 and 2

Data grup	Grup 1	Grup 2	t	p
Lumbar Fleksi				
Mean	7,43	8,29	-0,388	0.705
SD	4,117	4,152		
Lumbar Ekstension				
Mean	6,00	7,71	-1,008	0,333
SD	2,646	3,638		
Lumbar Lateral Flexion				
Mean	7,43	8,29	-0,455	0,657
SD	2,76	4,152		
FTSTS				
Mean	5,43	4,86	0,779	0,451
SD	1,134	1,574		

Based on the table above, the results of the independent sample t test are p value > 0.05 for all ROM and Five Time Sit To Stand, which means that there is no significant difference between the combination of MWD and Lateral Glide Mobilization with the combination of MWD and Ventral Glide Mobilization Kaltenborn on changes in lumbar ROM and functional capacity in patients with chronic low back pain.

Based on hypothesis testing using the paired sample t test p value <0.05, which means that the combination of MWD and Lateral glide mobilization Mulligan can provide significant changes in lumbar ROM and functional capacity in chronic low back pain conditions.

Microwave Diathermy is a diathermy modality that produces electromagnetic energy. If the energy is absorbed by the tissue it will cause an increase in tissue temperature. Increased tissue temperature can produce clinical effects or therapeutic effects on these tissues, including: increased nerve conduction

velocity, increased pain threshold, increased enzymatic activity acceleration, and increased soft tissue extensibility (Cameron, n.d, 2017). Through the application of Microwave Diathermy on the erector spine and quadratus lumborum muscles, clinical effects will occur, namely improving muscle extensibility and improving local circulation in these areas so that there can be a decrease in muscle tightness in both muscles.

The Lateral Glide Mobilization technique can help improve the limited mobility of the sacroiliac joint in patients with chronic low back pain. The direction of the lateral glide force applied to the dorsolateral ilium can be varied to produce the best outcome. This technique can be easily taught to others so it can be done at home (Wayne Hing et al., 2019).

Mulligan's lateral glide mobilization has the mechanical effect of improving pelvic position by restoring normal arthrokinematic and osteokinematic movements and combining pain-free accessory mobilization with active and/or passive physiological movements (Pourahmadi et al., 2018).

Improvement of the mobility of the sacroiliac joint through the lateral glide technique can affect the improvement of ROM in lumbar flexion, extension, and lateral flexion, because of the strong kinematic relationship between the lumbar and pelvic. This is evident from the results of this study, where lateral glide application on the dorsolateral ilium can result in improvements in ROM of flexion, extension, and lateral lumbar flexion. Improvements in lumbar ROM and pelvic mobility can affect the functional ability of patients with chronic low back pain, especially ambulation activities from sitting to standing.

Based on hypothesis testing using paired t test, p value <0.05 was obtained for treatment group II, which means that the intervention of MWD and ventral glide mobilization Kaltenborn can provide changes in lumbar ROM and functional capacity in patients with chronic low back pain.

Kaltenborn's ventral glide mobilization is one of the interventions to correct problems with the sacroiliac joint. Application of the ventral glide on the dorsolateral ilium can move the pelvis ventrally and correct the pelvic position (Kisner & Colby, 2013). Based on a 2016 study by Shah & Kage, ventral glide mobilization has been shown to be superior in increasing lumbar extension resulting in better functional outcomes.

The addition of ROM in flexion, extension, and lateral lumbar flexion occurs because of the improvement in pelvic mobility (sacroiliac joint) through the application of ventral glide mobilization. This happens because of the kinematic relationship between the lumbar and pelvic in the lumbopelvic rhythm pattern, where lumbar movements are always followed by pelvic movements and vice versa. Improvements in ROM of lumbar flexion, extension, and lateral flexion accompanied by improvement of pelvic mobility can affect the improvement of functional abilities, especially ambulation activities from sitting to standing.

Based on hypothesis testing using independent t test, p value > 0.05 for Five Time Sit To Stand (FTSTS), as well as ROM flexion, extension, lumbar lateral flexion which means that the combination of MWD and Mulligan lateral glide mobilization is not more effective than the combination of MWD and ventral glide mobilization Kaltenborn on changes in lumbar ROM and functional capacity in patients with chronic low back pain.

However, looking from the mean value of the difference in ROM of flexion,

extension, and lateral lumbar flexion, it was shown that it was slightly larger in the Kaltenborn ventral glide mobilization intervention than the Mulligan lateral glide mobilization intervention.

Both ventral glide mobilization and lateral glide mobilization produce a mechanical effect, namely improving the mobility of the pelvic-sacroiliac joint. Improved pelvic mobility can result in improved ROM of lumbar flexion, extension, and lateral flexion, because of the kinematic relationship between the lumbar and pelvic. However, ventral glide mobilization can result in slightly greater improvements in ROM of lumbar flexion, extension, and lateral flexion compared to lateral glide mobilization.

This is because the greater ventral glide technique results in a change in pelvic position from posterior pelvic tilting to a normal position so that it is slightly larger resulting in an improvement in pelvic mobility, which will then be followed by an improvement in ROM of flexion, extension, and lateral lumbar flexion. Thus, based on the results of the study, the mean value of the difference showed that the ventral glide technique was slightly better at improving ROM of lumbar flexion, extension, and lateral flexion compared to the lateral glide technique.

CONCLUSION

The conclusion of this study is that the combination of MWD and Lateral Glide Mobilization Mulligan can have a significant effect on changes in lumbar ROM and functional capacity in patients with chronic low back pain. The combination of MWD and Ventral Glide Mobilization Kaltenborn can have a significant effect on changes in lumbar ROM and functional capacity in patients with chronic low back pain. The combination of MWD and Lateral Glide Mobilization Mulligan was no more effective than the combination of MWD and Ventral Glide Mobilization Kaltenborn on changes in lumbar ROM and functional capacity in patients with chronic low back pain.

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The purpose of this study was to determine the difference in the effect of the combination of MWD and Mulligan lateral glide mobilization with the combination of MWD and ventral glide mobilization Kaltenborn on the improvement of lumbar range of motion and functional capacity in patients with chronic low back pain. This study aims to determine the effect of the combination of MWD and Mulligan's lateral glide mobilization on the improvement of lumbar range of motion and functional capacity in patients with chronic low back pain.

To determine the effect of the combination of MWD and ventral glide mobilization Kaltenborn on improving lumbar range of motion and functional capacity in patients with chronic low back pain. To compare the effect of the combination of MWD and Mulligan's lateral glide mobilization with Kaltenborn's ventral glide mobilization on the improvement of lumbar range of motion and functional capacity in patients with chronic low back pain.

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