

CASE STUDY: PHYSIOTHERAPY MANAGEMENT IN LUMBAR VERTEBRA "C" TYPE SCOLIOSIS WITH MICRO WAVE DIATHERMY MODALITY AND KLAPP EXERCISE

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Riwayat Artikel

Submitted:10/08/2025

Accepted:10/09/2025

Published:30/09/2025

ABSTRACT

Scoliosis is a disorder due to musculoskeletal dysfunction and deformity in the spine, where there is a postural deviation caused by many things, with the characteristics of a lateral curve in the frontal plane that can be related to transverse and sagittal rotation. problematic scoliosis is pain, spasms, limited range of motion, impaired posture, and decreased functional activities. In this case, the technology chosen modalities are Micro Wave Diathermy (MWD) and Klapp Exercise.

The purpose of this study was to determine the effect of physiotherapy management on lumbar scoliosis with MWD and Klapp Exercise modalities. This research design used is descriptive analytic method. The research subjects were patients with lumbar scoliosis type "C" at Kajen Hospital, Pekalongan Regency. Methods the research data collection used autoanamnesis and Physical examination methods. The results of the study for 5 treatments showed a decrease in pain T3, a decrease in, a decrease muscle spasm muscle erector spine at T5, an increase in the range of motion of the trunk lateral flexion dextra-rotation dextra at T2, a decreased degree of scoliosis at T5. The conclusion of the study is that physiotherapy interventions with mwd modalities and exercise clubs can reduce problems that arise in conditions of lumbar scoliosis.

Keywords: *Scoliosis, MWD, Klapp Exercise*

INTRODUCTION

The human spine is a pillar or post that functions as a body support, while also protecting nerves that are vital for human survival, such as the spinal cord. Poor posture habits can lead to several postural abnormalities. Deviations in posture that do not align with proper alignment—the body positioning relative to gravity and the base of support—can trigger a protective mechanism from the spinal muscles to maintain balance, resulting in manifestations of overuse on one

side of the muscles. If this occurs continuously, an imbalance of body posture to one side will develop, which can also be referred to as scoliosis (Rahayussalim, 2011). Scoliosis is a disorder resulting from musculoskeletal dysfunction and deformity of the spine, involving a postural deviation caused by many factors, characterized by a lateral curve in the frontal plane which may be associated with transversal and sagittal rotation (Kadoury S, 2012). Changes in the shape of the spinal curve, called scoliosis, are



shown in the form of an "S" or "C" line on x-ray results. Scoliosis is divided into structural and non-structural (postural) scoliosis. Structural scoliosis can be further divided into idiopathic (known cause) and non-idiopathic (unknown cause) (Kadoury S, 2012).

Initially, postural abnormalities such as scoliosis do not cause disturbances; however, if left untreated for a long period, there will be an increase in the degree of the scoliosis curve, leading to physical changes in the child, such as an imbalance in the thoracic position, a protruding scapula on one side, and asymmetrical shoulder positions. These abnormalities can have a negative impact on body posture (National Scoliosis Foundation, 2009). Several factors causing scoliosis are congenital, poor muscle control or muscle weakness (neuromuscular), and idiopathic (unknown cause). A scoliosis curve is categorized as mild if the formed Cobb angle is $<25^\circ$; moderate if it is $25-45^\circ$; and severe if it is $>45^\circ$. Many actions can be taken to handle scoliosis, such as surgery if the scoliosis curve has a large degree of bending of more than 40 degrees.

The World Health Organization (WHO) notes that at least 3% of citizens in the world are vulnerable to scoliosis. Based on data from The American Academy of Orthopaedic Surgeons in 2004, there were approximately 1.26 million patients with spinal disorder cases in health services, and 93% of them were diagnosed with scoliosis (National Scoliosis Foundation and DePuy Spine, Inc. 2009). Daruwalla found that the prevalence of scoliosis based on age is higher for adolescents than for children: 0.12% in the 6-7 year age group; 1.0% in the 11-12 year age group; and 3.12% in the 16-17 year age group (only girls were investigated in the second group). According to the National Scoliosis Foundation in 2016, females are 8 times more likely to experience scoliosis than males.

Physiotherapy problems in scoliosis include tenderness in the vertebral muscles, pain during trunk movement, spasms in the vertebral muscles, limited range of motion of joints, body posture disturbances, and

functional activity limitations. Therefore, physiotherapy plays a role in reducing the symptoms caused. Physiotherapy modalities that can be used to overcome problems caused by scoliosis are Micro Wave Diathermy and Klapp Exercise.

Micro Wave Diathermy in scoliosis aims to reduce or eliminate pain and reduce muscle spasms. Through the heat effect produced, in both sub-thermal and thermal states, it can produce a sedative effect that will result in a relaxation effect on the muscles (Sudarsini, 2017). In addition to Micro Wave Diathermy, physiotherapy can also provide therapeutic exercise in the form of Klapp exercise; this therapy focuses on stretching movements and strengthening the posture experiencing problems that cause scoliosis (Lunes DH, 2010). Rudolph Klapp, the inventor of this method, explained that the positions for performing muscle stretching and strengthening are very easy and can be applied in small exercise groups (Lunes DH, 2010). Klapp exercise can build strength, endurance, agility, and coordination, leading to the overall activation of muscle fibers and a reduction in the curvature of the spine (Lau, 2013).

METHODS

1. Research Design

This study utilizes a descriptive-analytic method to determine the assessment and observable changes within the research. The research design employed is a "case study." The descriptive-analytic method is a method for researching groups of humans, objects, systems of thought, or classes of current events. Analysis aims to identify the assessment and changes that can be observed in the research (Notoatmojo, 2010).

The conceptual framework of this case study is illustrated as follows:

- **X:** The patient's condition before the administration of the physiotherapy program.
- **Z:** The physiotherapy program.

- **Y:** The patient's condition after the administration of the physiotherapy program.

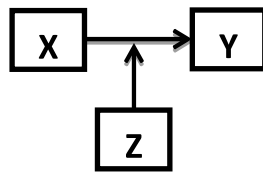


Fig. 1 Research Framework

2. Research Instruments

a. Pain with Visual Analogue Scale (VAS)

The assessed pain includes static pain, tenderness, and motion pain, with the following scoring criteria:

0 cm = no pain and

10 cm = unbearable pain

(Mardiman, et al., 1994).

b. Muscle Spasm with Palpation

The scoring criteria for muscle spasm are:

0 = no spasm,

1 = presence of spasm

(Sujatno, 2002).

c. Range of Motion (ROM) with Midline and Goniometer

The assessment criteria for trunk ROM using a midline are:

1. **Flexion-Extension:** The normal difference between the neutral position and the movement position is 10 cm.
2. **Lateral Flexion:** If there is a difference between right and left lateral flexion, it indicates a limitation of ROM on one side.

The assessment criteria for trunk ROM using a goniometer are:

Rotation: R 45°- 0°- 45° (Russe & Gerhard, 1975).

d. Body Posture with Adam's Forward Bending Test

Examination is conducted by observing the patient from behind and instructing the patient to bend 90° with arms hanging down. It is categorized as mild scoliosis if the body

posture still appears symmetrical, moderate if structural changes in the vertebrae and ribs are visible, and severe if there is a greater rotation of the vertebrae and ribs.

e. Functional Activity with Oswestry Disability Index

The scoring criteria for the Oswestry Index are:

1. Minimal disability: 0% - 20%
2. Moderate disability: 21% - 40%
3. Severe disability: 41% - 60%
4. Cripple (very severe): 61% - 80%
5. 81% - 100%: The patient is bed-bound or unable to perform activities at all.

(Davidson & Keating, 2002).

3. Data Collection Methods

a. Primary Data

1. **Physical Examination:** Aims to determine the physical condition of the patient, consisting of vital signs, inspection, palpation, basic movement examination, and other assessments related to the condition of Lumbar Vertebra "C" Type Scoliosis.
2. **Interview:** This method is used to collect data through a question-and-answer session between the therapist and the data source/patient via auto-anamnesis.
3. **Observation:** Conducted to observe the patient's progress before therapy, during therapy, and after the administration of therapy.

b. Secondary Data

1. **Documentation Study:** In the documentation study, the author observes and reviews medical and physiotherapy records from start to finish for patients with conditions such as Low Back Pain e.c Lumbar Spondylosis.
2. **Literature Study:** In this study, sources are taken from books, journals, or the

internet related to the condition of "C" Type Lumbar Scoliosis.

The research was conducted as a single-subject case study involving one patient, Ms. N.M., a 15-year-old female diagnosed with Lumbar Vertebra "C" Type Scoliosis. The clinical intervention was performed at RSUD Kajen over five therapeutic sessions. Each session integrated the application of Micro Wave Diathermy (MWD) to address soft tissue issues followed by specific Klapp Exercise protocols to correct the spinal curvature.

Data collection was performed systematically throughout the treatment period. Initial assessments (Pre-test) were conducted during the first session (T1) to establish a baseline, followed by continuous monitoring in each subsequent session (T2, T3, T4). The final evaluation (Post-test) was completed in the fifth session (T5) to measure the cumulative changes in pain levels, muscle spasm, range of motion, and the Cobb angle, ensuring a comprehensive analysis of the treatment's effectiveness.

RESULTS AND DISCUSSION

Results

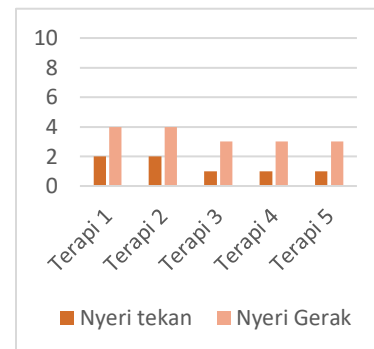
After conducting physiotherapy sessions on Ms. N.M., 15 years old, with a diagnosis of lumbar scoliosis using Micro Wave Diathermy and Klapp Exercise modalities, the final therapeutic results are as follows:

1. There is a decrease in tenderness in the m. erector spinae and motion pain during flexion, extension, and lateral flexion (both right and left).
2. There is a reduction in muscle spasm of the Latissimus Dorsi.
3. There is an increase in the range of motion for right lateral flexion and right-left rotation.
4. There is a decrease in the degree of scoliosis.
5. There is an increase in functional activity capabilities, specifically in lifting, prolonged standing, and prolonged sitting.

Discussion

The evaluation results obtained after the first to the fifth therapy sessions for the patient with scoliosis include:

1. Pain The pain examination for Ms. N.M. with scoliosis used the VAS scale with a rating of 0 = No pain (during both rest and activity), 10 = Unbearable pain (continuous pain, to the point where the patient is unable to perform activities).



Graph 1. Pain Examination Results

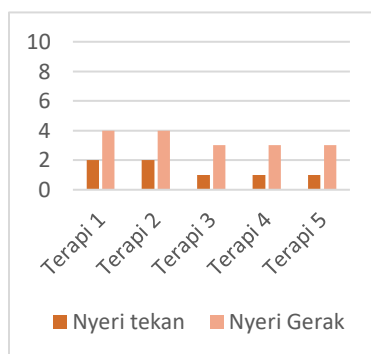
From Graph 1, the following data were obtained: tenderness at T1 = 1 decreased to T5 = 0; motion pain at T1 = 4 decreased to T4 = 3. The administration of Micro Wave Diathermy (MWD) can reduce pain because MWD is a therapeutic application using electromagnetic waves that emit radiation. MWD can produce a thermal effect aimed at increasing the physiological tissue repair process, normalizing muscle tone through the sedative effect produced by MWD, and improving metabolism which can reduce pain and spasms.

Furthermore, the thermal effect generated by MWD can be followed by vasodilation of blood vessels, which increases blood flow. This increase helps clear accumulated metabolic waste products that often cause muscle spasms and pain. By smoothing the waste removal process, tense muscles become relaxed and pain is reduced.

This is consistent with research by Dwi Yuda A. (2015) titled *Physiotherapy Management in Low Back Pain (LBP) Cases Due to Scoliosis with Micro Wave Diathermy (MWD) Modality and Core Stabilization at*

RSUD Salatiga. The effects of using MWD can reduce pain because it increases temperature, which triggers vasodilation, thereby improving blood circulation and metabolism. It provides a direct heat effect that can improve the flexibility of connective tissue and muscles, reduce pain and decrease muscle spasms.

2. Muscle Spasm Spasm examination is formulated with a value of 0 = no spasm and 1 = presence of spasm. From T1 to T5, the results showed a decrease in spasms in the latissimus dorsi muscle and the left side by the 5th session (Graph 2).

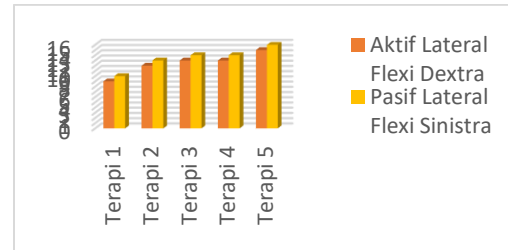


Graph 2. Spasm Examination Results

The administration of Micro Wave Diathermy can reduce pain because MWD is a therapeutic application using electromagnetic waves. MWD produces a thermal effect aimed at increasing the physiological tissue repair process and normalizing muscle tone through its sedative effect, as well as improving metabolism to reduce spasms.

Additionally, the thermal effect of MWD is followed by vasodilation, increasing blood flow and clearing metabolic waste. This process allows tense muscles to relax and reduces pain. This aligns with Dwi Yuda A. (2015), where the heat from MWD improves tissue flexibility and reduces muscle spasms.

3. Range of Motion (ROM) The examination of the range of motion used a midline. The assessment results from T1 to T5 showed an increase in trunk ROM by the 5th therapy session (Graph 3).

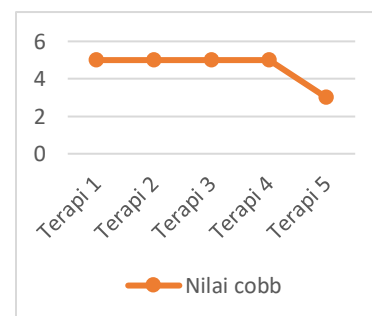


Graph 3. ROM Examination Results

Klapp Exercises aim to stretch and strengthen muscles. In Klapp Exercise training, using a quadruped (crawling) position allows a person to move mobilely according to the applied exercise form. When performed with a determined dosage, it will lead to an increase in the range of motion. Klapp exercise can make muscles stronger by effectively strengthening the stimulation of muscle fibers, allowing the fibers to be activated as a whole.

This is consistent with research by Nia Kurniawan (2019) titled *Comparison of the Effect of Self-Correction and Task-Oriented Exercise with Klapp Exercise on the Degree of Scoliosis in Middle School Students with Type C Idiopathic Scoliosis*. The Klapp method plays a role in building flexibility and muscle tissue strength through eccentric action, which serves to increase motor learning stimulation in postural muscles to improve functional movement and coordination.

4. Degree of Scoliosis The decrease in the degree of scoliosis using the Cobb angle showed a reduction from T1 = 5° to T5 = 3° (Graph 4).

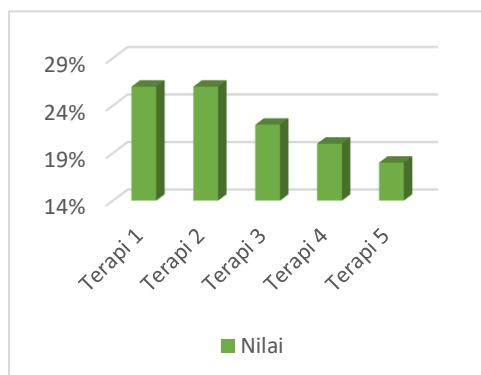


Graph 4. Scoliosis Degree Examination Results

Klapp Exercise therapy is conducted with the goal of spinal stability and symmetry. The exercises have a significant impact on strengthening bones and building more strength, endurance, agility, and coordination, so that the spinal curvature reduces to below twenty degrees, provided the patient is accustomed to the routine in the exercise program.

In Klapp Exercise movements, stretching and strengthening of the trunk muscles occur according to the location of the curvature. Shortened muscles undergo stretching, while elongated muscles undergo strengthening by effectively stimulating muscle fibers. This aligns with research by Sari S (2013), which states that Klapp Exercise can reduce the degree of scoliosis by simultaneously strengthening and stretching muscles, making it effective in reducing curvature. Furthermore, Nia Kurniawan (2019) stated that Klapp Exercise shows a significant influence in reducing the degree of scoliosis because it can activate muscle fibers as a whole.

5. Functional Activity Assessment of functional activity used the Oswestry Index with 10 assessment items. The results showed an improvement from T1 = 26% to T6 = 18%, indicating a decrease in dependency levels from moderate dependency to minimal dependency (Graph 5).



Graph 5. Functional Activity Examination Results

The improvement in functional activity occurs because the administration of

Microwave Diathermy and Klapp Exercise for scoliosis significantly addresses problems such as pain, muscle spasms, limited range of motion, and the degree of scoliosis. Once these issues are resolved, it positively impacts functional activities and patient capability.

According to Sari (2013), Klapp Exercise can make muscles stronger and increase ROM while correcting posture, thus increasing functional activity. Similarly, Dwi Yuda A. (2015) found that MWD reduces pain and muscle spasms, thereby improving functional activities that had previously declined.

CONCLUSIONS

After 5 therapy sessions were conducted for Ms. N.M. with scoliosis at RSUD Kajen, the following conclusions were obtained:

1. There is a decrease in tenderness in the M. Latissimus Dorsi and motion pain during flexion, extension, and lateral flexion (both right and left).
2. There is a decrease in muscle spasm of the erector spinae.
3. There is an increase in the range of motion for right lateral flexion and right-left rotation.
4. There is a decrease in the degree of scoliosis.
5. There is an increase in functional activity capabilities, specifically in lifting, prolonged standing, and prolonged sitting.

REFERENCES

- Carriere, .. T. (1998). *The swiss Ball Theory. Basic Exercise*.
- Kadoury S, L. H. (2012). Classification of three-dimensional thoracic deformities in adolescent idiopathic scoliosis from a multivariate analysis. *Eur Spine J*, 21: 40–49.
- Kurniawati, N., Fadilla, N., & Ali, M. (2019). *Perbandingan Pengaruh Self*

Correction dan Task Oriented Exercise dengan Klapp Exercise terhadap Derajat Skoliosis Siswa SMP dengan Skoliosis Idiopatik Tipe C. *Quality: Jurnal Kesehatan*, 13(2), 82-90.

Lau, K. Dr. 2012. Program Pencegahan Dan Penyembuhan Skoliosis.

Lunes, D. c. (2010). *Quantitative Photogrammetric Analysis of the Klapp for treating idiopathic scoliosis*.

Mardiman, S. dkk. (1995). *Dokumentasi Persiapan Praktek Profesional Fisioterapi (DP3FT)*. Surakarta: Akademi Fisioterapi Surakarta DEPKES RI.

Notoatmojo, S. (2010). *Metodologi Penelitian Kesehatan*. Jakarta: Rineka Cipta.

Rahayusalim. Dr. Sp.Ot(k).2011. *Kelainan Pada Tulang Belakang Anak. Scoliosis*.

Russe, O. A. (1975). *International SFTR Method Of Measuring And Recording Joint Motion*. s.l.:Hans Huber . Publisher Bem Stuttgart Vienna.

Sari, S. &. (2013). Swiss Ball Exercise dan Koreksi Postur tidak Terbukti Lebih Baik Dalam Memperkecil Derajat Skoliosis Idiopatik Daripada Klapp Exercise Dan Koreksi Postur Pada Anak Usia 11-13 Tahun.

Sudarsini. (2017). *Fisioterapi. Malang : Gunung Samudra*. Malang : Gunung Samudra

Sujatno, d., 2002. *Sumber Fisis*. Surakarta: politeknik Kesehatan Surakarta.

Yuda Ariyanto, D., & Fis, S. S. (2015). *Penatalaksanaan Fisioterapi Pada Kasus Low Back Pain (LBPP) Akibat Scoliosis Dengan Modalitas Micro Wave Diathermy (MWD), Core Stabilitation Di RSUD Salatiga (Doctoral dissertation, Universitas Muhammadiyah Surakarta)*.

