*International Journal of Health Sciences and Research*
*[Indexed, Peer-Reviewed Journal]*
*Volume 15; Issue: 6; June 2025*
*Website: www.ijhsr.org*
*Case Study* *ISSN: 2249-9571*

# A Case Study: Physiotherapeutic Intervention Along with Kinesio Taping in Duchenne Muscular Dystrophy Patient

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**DOI: https://doi.org/10.52403/ijhsr.20250622**

## ABSTRACT

**Background:** Muscular dystrophy (MD) encompasses a group of genetic disorders characterized by progressive muscle weakness and degeneration. Supportive therapies aim to preserve function, reduce discomfort, and improve quality of life. Kinesio Taping (KT), a therapeutic technique involving the application of elastic adhesive tape, has been widely used in various musculoskeletal and neurological conditions to provide support without restricting range of motion.
**Objective:** This case study aims to evaluate the potential benefits of Kinesio Taping as a complementary therapy in a patient diagnosed with Duchenne Muscular Dystrophy (DMD), focusing on pain reduction, functional improvement, and quality of life.
**Methods:** A 28-year-old female diagnosed with DMD was administered Kinesio Taping across the paraspinal, quadriceps, and gastrocnemius muscles over a period of four weeks. The Berg balancing scale (BBS) and the patient-reported outcomes measurement information system (PROMIS-29) were used to assess the methodologies and scales.
**Results:** The patient exhibited a modest improvement in posture and a reduction in reported muscle fatigue and pain. No adverse effects were observed during the treatment period.
**Conclusion:** Kinesio Taping may offer a non-invasive, low-cost adjunctive therapy in the supportive care of muscular dystrophy patients. Though not curative, it may assist in improving functional outcomes and quality of life. Further research with larger samples and control comparisons is recommended to validate these findings.

***Keywords:*** muscular dystrophy, Kinesio taping, musculoskeletal disorder

## INTRODUCTION

Clinical and dystrophic pathological characteristics on muscle biopsy are shared by a genetically, clinically, and biochemically diverse group of illnesses known as muscular dystrophies. One Their hallmark is increasing muscle weakening that varies in severity and affects the limb, axial, and face muscles[1]. Inherited myogenic disorders known as muscular dystrophies are characterized by progressive muscle atrophy and weakness that varies in severity and distribution. According to the distribution of the major muscular weakness, they can be further classified into a number of groups, including congenital forms: distal, facioscapulohumeral, oculopharyngeal, Duchenne and Becker,

and the most diverse group, the limb-girdle muscular dystrophy. English physician Edward Meryon was the first to describe Duchenne muscular dystrophy, the most prevalent of these hereditary illnesses[2]. Intellectual impairment, skeletal muscle, smooth muscle, and cardiac muscle wasting, as well as increasing muscle weakness, are the hallmarks of Duchenne Muscular Dystrophy (DMD), an X-linked recessive illness (Xp21) of the muscles. Recent research has shown that DMD is caused by a defective gene that encodes a protein called "dystrophin," which results in the total absence of the cytoskeletal protein dystrophin in both skeletal and cardiac muscle fibers. It is caused by mutations in the DMD gene on the X chromosome1, 2, and 3[3]. While the pooled global DMD birth prevalence was 19.8 (95% CI:16.6–23.6) per 100,000 live male births, the pooled global DMD prevalence was 7.1 cases (95% CI: 5.0–10.1) per 100,000 men and 2.8 cases (95% CI: 1.6–4.6) per 100,000 in the general population[4]. BMD is a milder variant of DMD, with patients typically experiencing delayed start and slower disease progression, eventually becoming wheelchair-bound beyond the age of 16. Dystrophin mutations related with BMD frequently result in a somewhat shortened but functional protein, whereas most dystrophin mutations connected with DMD result in the absence of dystrophin. Cardiomyopathy is a common comorbidity of DMD and BMD, a heart ailment in which the cardiac muscle weakens, causing the heart to pump blood inefficiently. This eventually results in life-threatening consequences including dilated cardiomyopathy (DCM). Although all MDs are hereditary illnesses characterized by muscle weakening and muscle cell death, clinical onset and development differ depending on the kind of MD[5].

Limb-Girdle Muscular Dystrophy (LGMD) is a group of muscular dystrophies characterized by muscle weakness and atrophy, particularly in the proximal arms and legs. These are classified into two categories: LGMD1 and LGMD2. LGMD1 covers varieties with a dominant mode of heredity, whereas LGMD2 refers to autosomal recessive modes of inheritance.

Gower's sign, which is common in patients with calpainopathy and a clinical symptom in those with certain neuromuscular disorders, is most typically seen in LGMD2A. When a patient has cardiac and respiratory problems, it is recommended that they breathe rapidly and deeply. Depending on the level of muscle weakness, patients may experience dyspnea both at rest and during physical exercise. This symptom of diaphragmatic weakness, which can be a defining hallmark of LGMD2A, exists. Physiotherapy plays an important role in regulating LGMD by helping patients maintain their general physical function, as well as their muscle strength and flexibility.

Exercises of low to moderate intensity, such as range-of-motion drills and stationary cycling, can help maintain muscle function, promote joint mobility, and improve overall physical well-being. Strenuous or demanding exercises may be inappropriate for people with LGMD since they can weaken and injure their muscles. When considering an exercise program for a person with calpainopathy, it is essential to see a medical professional who has experience treating people with muscular dystrophy.

## CASE REPORT

A 28-year-old female patient, case of muscular dystrophy having history of initial weakness of lower limb and frequent falls while walking at age of 8 years. She was a normal child with normal walking up to 6 years old. She started difficulty in walking for 8 years old from which she gradually developed toe walking and difficulty in getting up from the floor. At 14 years of age, she started facing difficulty in climbing stairs, jogging, rising from sitting on the floor, and extending her arms above her head. There is no history of twitching, limb discomfort, cranial nerve involvement, or sensory complaints, and no bladder or

bowel involvement except having severe pain in calves. There was a history of breathlessness when performing an activity. Her symptoms were progressive in nature. She consulted a orthopaedic doctor in 2017 who diagnosed her with scoliosis because of her 12-hour sitting job with without interruptions. In 2024, she quit her job as her symptoms aggravated due to scoliosis and joint pain.

Kinesio taping (KT) is becoming increasingly popular among physicians for treating musculoskeletal disorders. Kenzo Kase created the KT in 1976. The tape is virtually the same thickness as the epidermis. It consists of a polymer elastic string wrapped in cotton fibers and may be stretched lengthwise. Kinesio taping improves proprioception and relieves muscle tension in healthy athletes.(7)

Kinesiology taping (KT) combines elastic and adhesive taping. This technique is used instead of sports taping to support fascia, muscles, and joints for placement, inhibition, and facilitation. Tapes can expand to 40-60% of their original length. This tension is similar to the elastic properties of human skin, resulting in reduced mobility limitation compared to traditional tapes. Research suggests that KT stimulates skin receptors, regulating muscle tone, reducing pain, correcting incorrect posture, and improving proprioception. KT application methods can impact gait kinematics in unique ways. In young females, KT with facilitation technique improved cadence, stride length, walking speed, and maximal knee extension, while inhibition technique decreased knee power, increased knee flexor moment during the terminal swing phase, and decreased knee flexion during walking when compared to no-tape.(8)

KT is the suggested way for improving coordination while standing and walking. KT is commonly utilized in orthopedic, traumatic, and neurological patients to increase static stability. The literature contains two theories that describe how KT affects stability. The first theory suggests that KT acts as a postural control mechanism by influencing joint stiffness. The second idea suggests that KT affects skin extensibility, irritating proprioceptors and transmitting sensory information to the central nervous system. Sensory feedback enhances standing and posture control.(9,10)

**Clinical findings**

The patient was afebrile on general examination, with a heart rate of 68 beats/min, a blood pressure of 125/85 mm Hg, and a respiratory rate of 13 breaths/min. Cardiorespiratory system evaluation was routine. Cognitive function, speech, and cranial nerves were intact after a neurological test. Her sensory system was intact. She presented with weakness in both shoulders, wasting in both deltoids, pseudo-hypertrophy in both calves and normalized tone in all four limbs. On physical examination, the patient had generalized body weakness but lower limb is more affected than upper limb and trunk muscles. Weakness in upper limbs (4/5) and lower limb (3/5) bilaterally.

She had difficulty in sit to stand and noticed Gower's sign as well as deformity in ankle joint. Her feet were slightly in pronated and plantar flexed. He had full range of motion in both upper limbs but reduced range of motion in both lower limbs.

| Muscles | Pre-rehabilitation on the left side | Pre-rehabilitation on the right side | Post-rehabilitation on the left side | Post-rehabilitation on the right side |
|---|---|---|---|---|
| Hip flexors | 3/5 | 3/5 | 4/5 | 4/5 |
| Hip extensors | 3/5 | 3/5 | 4/5 | 4/5 |
| Hip abductors | 3/5 | 3/5 | 4/5 | 4/5 |
| Hip adductors | 2/5 | 2/5 | 3/5 | 3/5 |
| Knee flexors | 3/5 | 3/5 | 4/5 | 4/5 |
| Knee | 3/5 | 3/5 | 4/5 | 4/5 |

| | | | | |
|---|---|---|---|---|
| extensors | | | | |
| Ankle dorsiflexors | 1/5 | 1/5 | 1/5 | 1/5 |
| Ankle plantar flexors | 1/5 | 1/5 | 1/5 | 1/5 |
| Trunk flexors | 3/5 | 3/5 | 4/5 | 4/5 |
| Trunk extensors | 2/5 | 2/5 | 3/5 | 3/5 |
| Trunk rotators | 3/5 | 3/5 | 4/5 | 4/5 |

**Table 1: Strength Ratings (Manual Muscle Testing) By Medical Research Council Grading**

The nerve conduction tests were normal. Muscular dystrophy was found via a muscle biopsy. Electromyography of the upper and lower limbs showed a myopathic pattern. Limb-girdle muscular dystrophy was identified using the following criteria: history, proximal muscle weakness, grower's sign, high erythrocyte sedimentation rate, creatine kinase-myocardial binding, creatinine kinase, reduced creatinine, and electromyography.

| Items | Patient's observed value | Normal value |
|---|---|---|
| ESR | 36 mm/hr | 0-20 mm/hr |
| CREATININE | 0.38 mg/dl | 0.59 to 1.04 mg/dL |
| CKMB | 42 U/L | 24 U/L |
| CK | 351 U/L | 30 -150 U/L |

**Table 2: The Complete Blood Count Report**

## Investigation

The patient's main complaint was fatigue, which can have a severe impact on one's overall quality of life. Loss of movement also needed to be addressed because it makes it difficult to do everyday tasks and keep muscles toned. Furthermore, diminished muscle strength exacerbates their physical limitations. The patient reported trouble with daily tasks such as using the restroom, which could be due to dynamic balance issues, particularly when sitting and standing.

Physical therapy's broad and patient-centred aims were designed to address these concerns. The patient was taught procedures for increasing muscular strength, increasing range of motion, and improving balance and gait. The therapy was intended to promote respiratory health and accelerate the return to normal physical activity. This comprehensive technique emphasizes the importance of resolving individual difficulties and restoring the patient's control over their physical health, hence improving overall quality of life. The management regimen includes physical therapy - upper and lower limb mobility exercises, strengthening activities, trunk strengthening exercises, hamstring and Achilles tendon stretching, breathing exercises, endurance training, and Kinesio taping.

## Physiotherapeutic Intervention Plan:

| Goals | Treatment | Intervention | Progression |
|---|---|---|---|
| Patient Education | Educate the patient and family members about their condition and its consequences. | To prepare the patient and his family to deal with the problem in the future, they were educated on diseases and their repercussions. | A home exercise program was demonstrated and implemented alongside rehabilitative treatment. |
| To improve respiratory function | Breathing exercises | Deep breathing exercises (10 repetitions * 2 sets), and pursed lip breathing (10 repetitions * 4 sets). | Thoracic expansion exercises (10 repetitions * 2 sets) and pursed lip breathing (10 repetitions * 2 sets) |
| To improve | Mobility and | Straight leg raises, dynamic quads | Straight leg raises, dynamic |

| | | | |
|---|---|---|---|
| muscle strength and range | strengthening exercises | (10 repetitions * 2 sets), Static abdominal muscle strengthening (10 repetitions * 2 sets), Active ROM exercises for both UL and LL with a 1⁄2 kg weight cuff (10 repetitions * 1 set) | quads (10 repetitions * 2 sets) with a 5–10 second hold., Active ROM exercises for both UL and LL with a 1 kg weight cuff (10 repetitions * 1 set) |
| | Stretching exercises | Hamstring and TA stretch (8 repetitions, 10 seconds of hold) | Hamstring and TA stretch (3 repetitions, 30 seconds of hold) |
| To improve trunk control | Trunk control | Pelvic bridging (10 repetitions * 2 sets), trunk movements: forward, backward, and sideways (10 repetitions * 2 sets), pelvic rotation to each side (10 repetitions * 2 sets) | Wall squats with a Swiss ball (10 repetitions * 2 sets) |
| To improve balance while sitting | Static and dynamic balance in sitting. | Sit-to-stand exercise (10 repetitions * 1 set) | Pivot transfer in sitting (10 repetitions * 1 set) |
| To improve balance and gait | Balance and gait training | Tandem standing (5 minutes) and walking (10 repetitions *1 set) | Wobble board training (5 minutes), side-to-side walking, and tandem walking (10 repetitions *1 set) |
| | | Kinesio taping by internally rotating the knee to enhance stability (1 week gap) | |
| To improve endurance | Endurance training | standing with wedge under heel in a day for 20 min with intermittent rest | standing with wedge under heel in a day for 100 min with intermittent rest |
| To reduce fatigue | Pacing activity | AROM of scapular elevation, protraction, and retraction (10 | Reduce pacing timing; AROM of scapular elevation, protraction, and retraction. (10 repetitions * 2 sets) with a 5–10 second hold. |

**Table 3: Physiotherapy Treatment Plan Based on the Patient's Concerns and Goals**

**Figure 1: Kinesio Taping by Internally Rotating the Knee**

**Outcome measures**

The Berg balancing scale (BBS) and the patient-reported outcomes measurement information system (PROMIS-29) were used to assess the methodologies and scales. These scales and methods are crucial for determining the impact of a patient's disease on their lives and prioritizing interventions and support services.

| OUTCOME MEASURE SCALES | PRE-TREATMENT | POST- TREATMENT |
|---|---|---|
| BBS | 40/56 | 48/56 |
| PROMIS-29 | Physical function: 5/20; anxiety: 14/20; depression: 14/20; fatigue: 16/20; sleep disturbance: 14/20; ability to perform activity: 7/20; pain interference: 10/20 pain intensity: 5/10 | Physical function: 9/20; anxiety: 12/20; depression: 10/20; fatigue: 12/20; sleep disturbance: 10/20; ability to perform activity: 7/20; pain interference: 6/20; pain intensity: 3/10 |

**Table 4: Outcome Measures Used to Note the Progress of the Patient**

## RESULT

The effectiveness of the physiotherapy and Kinesio Taping intervention was evaluated using the Berg Balance Scale (BBS) and the Patient-Reported Outcomes Measurement Information System (PROMIS-29). These tools provided quantitative insight into the patient's functional status, emotional well-being, and symptom burden both before and after the four-week intervention.

The patient demonstrated a significant improvement in static and dynamic balance. The 8-point increase indicates enhanced safety in mobility and a reduced fall risk, particularly in tasks such as turning, reaching, and transferring.

These PROMIS-29 results highlight moderate improvements across most domains, especially in pain, depression, fatigue, and physical function. The ability to perform activities remained stable, possibly due to the chronic nature of DMD and its limitations on function progression.

## DISCUSSION

LGMD related impairment is identified based on the pathogenesis, level of clinical involvement, and pace of advancement. Patients with LGMD experience gradual degeneration of functional skeletal muscles and progressive weakening. The Berg balancing scale (BBS) and the patient-reported outcomes measurement information system (PROMIS-29) were crucial for determining the impact of a patient's disease on their lives and prioritizing interventions and support services. Weakness, fatigue, low endurance, and other functional impairments are produced by inactivity-induced muscle fibre loss and atrophy. (6)

The purpose of the study was to evaluate the effectiveness of Kinesio taping in LGMD patient.(3) There is currently no effective pharmacologic treatment for LGMD, despite several therapeutic regimens being offered . Patients must therefore rely on symptomatic management, for which ongoing physical therapy is required. Physiotherapy's primary purpose is to maintain strength, functional capacity, and quality of life. Exercise is critical for maintaining and improving strength, endurance, gait, and quality of life in LGMD patients. Strength training (or progressive resistance exercise) enhances physical performance by increasing muscle mass, lean body mass, contractile force, and power. Exercise increases muscle growth by increasing muscle protein levels, particularly actin and myosin, as well as myofibril deoxyribonucleic acid content. During the initial recovery from LGMD, strength and endurance training looked to be a trustworthy and effective strategy.(6)

## CONCLUSION

Limb-girdle muscular dystrophy was diagnosed based on a history of proximal muscle weakness, Gower's sign, elevated

erythrocyte sedimentation rate, increased creatine kinase-myocardial binding, elevated creatinine kinase, reduced creatinine, and electromyogram. Muscular dystrophy was discovered through muscle biopsy. Significant differences were observed in the various outcome variables between the baseline examination and after two weeks of physiotherapy treatment, and the exercise suggestions in the case study focus mostly on the empirical benefits of strength and endurance training. The therapy has had a considerable influence on the patient's functional skills, as evidenced by better scores on scales such as the BBS and PROMIS-29. Low- to moderate-intensity exercises can help maintain muscle function, promote joint mobility, and improve overall physical health.

***Declaration by Authors***

**Acknowledgement:** We would like to express our sincere gratitude to the patient and her family for their cooperation, trust, and active participation throughout the course of this case study. Their openness and commitment were essential to the success of this intervention.

**Source of Funding:** None

**Conflict of Interest:** The authors declare no conflict of interest.

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How to cite this article: Pratima Sarwadikar, S P Prajna Prabha, Tushar Palekar. A case study: physiotherapeutic intervention along with Kinesio taping in Duchenne muscular dystrophy patient. *Int J Health Sci Res.* 2025; 15(6):169-175. DOI: *10.52403/ijhsr.20250622*

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