

Effects of Muscle Lengthening Taping Technique and Scar Taping Technique on Muscle Lengthening in a Hydrocephalus Patient: A Case Study

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Abstract: *Hydrocephalus is a common disorder of cerebral spinal fluid (CSF) physiology resulting in abnormal expansion of the cerebral ventricles. ⁽¹⁾ The definition of a knee flexion contracture is a knee that is unable to fully extend to 0°, either actively or passively. ⁽⁴⁾ This case study investigates the effects of Muscle Lengthening Taping Technique and Scar Taping Technique on an 18 year old Hydrocephalus patient. Over an 8 week period, these techniques were applied in two sessions per week. The results indicate that the Muscle Lengthening Taping Technique effectively lengthened the muscles, while the Scar Taping Technique showed visual and cosmetic effects but did not significantly contribute to muscle lengthening.*

Keywords: Kineiso taping, Hydrocephalus, Fixed Knee Deformity, Modified Thomas Test, Popliteal angle

1. Introduction

Hydrocephalus is a common disorder of cerebral spinal fluid (CSF) physiology resulting in abnormal expansion of the cerebral ventricles. The classic understanding of hydrocephalus as the result of obstruction to bulk flow of CSF is evolving to models that incorporate dysfunctional cerebral pulsations, brain compliance, and newly characterised water - transport mechanisms. Hydrocephalus has many causes. Congenital hydrocephalus, most commonly involving aqueduct stenosis, has been linked to genes that regulate brain growth and development. Hydrocephalus can also be acquired, mostly from pathological processes that affect ventricular outflow, subarachnoid space function, or cerebral venous compliance. ⁽¹⁾

The presentation of hydrocephalus depends very much on the age of the patient and the rate of progression of the hydrocephalus, with an important difference between cases arising before and after the closure of the cranial sutures. Before sutures close (<2 years): macrocephaly, head circumference increasing and crossing normal centile lines, conjugate down - deviation ('sun setting') of the eyes, distended scalp veins, developmental delay or regression, and poor feeding. After the closure of cranial sutures, the acute presentation includes headache, vomiting, drowsiness, papilledema, and coma in extreme cases. Chronic presentation and clinical features of normal pressure hydrocephalus include Urinary Incontinence cognitive impairments and gait disturbances. ⁽²⁾

A ventriculoperitoneal shunt (VP) is used most commonly for cerebrospinal fluid diversion. The abdomen should have the ability for absorption of the fluid. Shunts cause cerebrospinal fluid to flow unidirectional under a valve

system. Pressures required enough energy to overcome valve resistance and can be used in patients with different pressure requirements. The ventricular catheter can be placed from the coronal approach. In this approach most neurosurgeons prefer parieto - occipital catheters. The proximal catheter tip should lie anterior to choroid plexus and in the frontal horn of the lateral ventricles. ⁽³⁾

The definition of a knee flexion contracture is a knee that is unable to fully extend to 0°, either actively or passively. The aetiology of a pre - operative fixed flexion deformity is multifactorial; bony impingement, posterior capsular contracture, hamstring shortening, and ligament contracture all contribute to the inability to fully straighten the knee. ⁽⁴⁾

Hamstring lengthening surgery is a procedure done to relieve pain and tightness in the hamstring muscles and to improve posture. The hamstring lengthening surgery is carried out to relieve lower limb contractures and to increase the ability of the knees to straighten out i. e. undergo extension. Wound healing starts directly at the time when the initial injury occurs. The healed skin always results in a scar, and therefore, for both the patient and the physician, a major outcome parameter in wound healing is the quality of the final scar. In general, after superficial injury, the scar is barely or may not even be visible to the naked eye. In the case of a deeper wound, the scar is often visible but is seen as a smooth, pale and flattened scar known as a normotrophic scar. However, in predisposed individuals and on some predilection sites on the body (e. g. sternum, ear lobe), scar formation can result in increased fibrosis, which in turn can result in adverse scar formation (hypertrophic scar or keloid). A major challenge to scientists and physicians is to prevent increased fibrosis and understand why some individuals will form abnormal scars even after relatively minor injury ⁽⁵⁾

Volume 12 Issue 6, June 2023

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Medial and lateral Gastrocnemius are the primary muscles of the leg with major contributions at both ankle and knee joints. Hamstrings and Gastrocnemius are both knee flexors. Changes in gastrocnemius activity affects knee flexors activity. ^(13, 18)

One of the methods that can bring beneficial outcomes and help to avoid surgical interventions is Kinesio Taping. This method is based on kinesiology and the self - healing abilities of the organism. It takes advantage of the physical properties of the elastic therapeutic tape and specific methods of its application. ^{(7), (10)} The tape has properties similar to those of human skin; it extends up to 30–40% of its original resting length, allows for the evaporation of sweat, and its thickness is similar to that of the epidermis. The basic functions of the tape include: conscious normalization of muscle tone, activation of injured muscles, correction of joint position, improvement of the lymphatic function resulting in the reduction of edema, reduction of pain and oversensitivity in the involved skin and muscles, correction of the position of the fasciae and skin. ^{(8), (9)} Appropriate applications of Kinesio Tapes can improve both the appearance and perception of the scar, as well as reduce a patient's functional and emotional limitations associated with the existing scars

Kinesio taping (KT) is an alternative taping technique, based on the functions of the tape, that may improve the range of motion (ROM) (Kase et al., 1996; Sijmonsma, 2007). Two theories may provide insight in how KT works. One theory posits that KT increases blood circulation in the taped area (Kase, 1994) and that this physiological change may affect the muscle and myofascia functions after the application of KT. Another theory suggests that KT stimulates cutaneous mechanoreceptors at the taped area, and this stimulation may affect the ROM (Halseth et al., 2004; Murray and Husk, 2001). Therefore, muscle functioning could be improved with KT by regulating muscle tone (Sijmonsma, 2007). The aim of this study to observe the effects of muscle

lengthening taping Technique and scar taping Technique on muscle lengthening.

2. Case Report

An 18 yr old Patient with Hydrocephalus had undergone VP shunt Surgery in Rajiv Gandhi Government General Hospital, park town, Chennai at the age of 8 and taken physiotherapy treatment. After some years, Patient's parents noticed stiffness in both knee and abnormal gait. Patient had admitted in VELS Medical College and Hospital, Manjankaranai, Thiruvallur district and underwent Hamstring and Iliopsoas Release Surgery for Fixed Knee Flexion deformity and continued physiotherapy treatment in same hospital. There was noticed Hypertrophic Scar ⁽⁵⁾ and restricted mobility in Hamstring and Iliopsoas flexibility.

Kinesio Taping used to mobilize the Scar and Lengthen the hamstring and Iliopsoas Muscle using Scar Taping ^(6, 16) and Muscle Lengthening Taping ^(7, 13, 14, 19) respectively. The scar taping and Muscle Lengthening Taping was used. The duration of this study was 8 weeks (2 sessions per week). The two outcome measures were taken on 4th and 8th week of this study. Those were Modified Thomas Test (To assess the Hip Extension Mobility ⁽¹¹⁾) and Popliteal Angle (To assess the Knee Extension Mobility ⁽¹²⁾). The Muscle Lengthening Taping Technique used for first two weeks and Scar Taping Technique was applied for last two weeks.

Application of Taping:

Muscle Lengthening Taping:

The Muscle lengthening taping (Fig 1) was applied on bilateral hamstring, iliopsoas and Gastrocnemius muscle for muscle lengthening to improve Knee extension. The I tape was cut and applied over the Hamstring, Iliopsoas and Gastrocnemius Muscle with 15 to 25 percentage stretch by end to end method. ⁽¹⁹⁾



Figure 1

Scar Taping:

The Scar Taping (Fig 2) was applied on the scar (both anterior hip and Posterior Knee). The tape was cut into small pieces and applied over the scar horizontally by overlapping one over one. After that a single I tape applied over the tape already applied on Scar with end to end method. ^(6, 19)

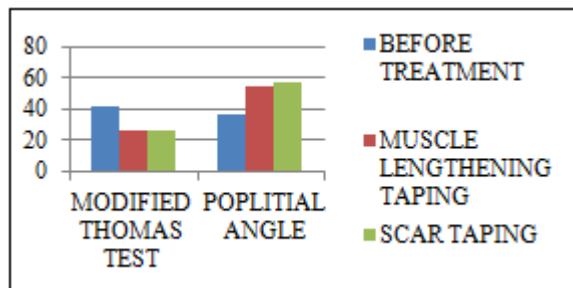


Figure 2

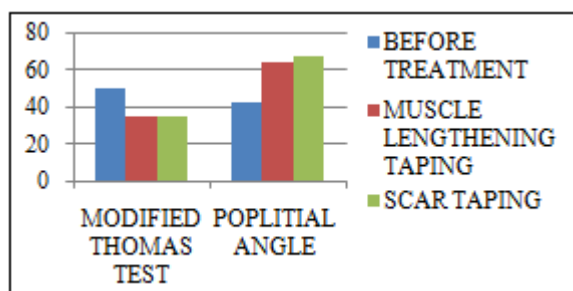
3. Discussions

Table 1

		4 th WEEK				8 th WEEK	
		Right	Left	Right	Left	Right	Left
Age		18y/M					
Modified Thomas Test	Active Rom	0 - 45 ⁰	0 - 40 ⁰	0 - 25 ⁰	0 - 30 ⁰	0 - 25 ⁰	0 - 30 ⁰
	Passive Rom	0 - 50 ⁰	0 - 50 ⁰	0 - 35 ⁰	0 - 35 ⁰	0 - 35 ⁰	0 - 35 ⁰
Poplital Angle	Active Rom	0 - 45 ⁰	0 - 30 ⁰	0 - 50 ⁰	0 - 60 ⁰	0 - 55 ⁰	0 - 60 ⁰
	Passive Rom	0 - 50 ⁰	0 - 35 ⁰	0 - 60 ⁰	0 - 70 ⁰	0 - 60 ⁰	0 - 75 ⁰



Graph 1



Graph 2

This graphical representation shows that The Muscle Lengthening Taping Technique is effective in the term of reduction in the mean value of Modified Thomas Test (AROM) (Graph 1) from 42.5 to 27.5 and Modified Thomas Test (PROM) (Graph 2) from 50 to 35 and improvement in the mean value of Poplital Angle (AROM) (Graph 1) from 37.5 to 55 and Poplital Angle (PROM) (Graph 2) from 42.5 to 65 in 4th weeks. This study suggests that the Muscle Lengthening Taping Technique is effective in muscle lengthening (Dedi Lumbroso, Eladziv, Elisha Verad, Leonid Kalichman et al. ., suggests that Taping Gastronemius would improve Knee Extension Angle and also implies that taping may gives different effect on different muscles ⁽¹³⁾. Saryn R. Goldberg, Frank C. Anderron, Marus. G. Pandey, scott L. Elp: identified that Iliopsoas and Gastrocnemius were identified as muscle contribute most to the increasing Knee Flexion velocity during double support. ⁽¹⁷⁾ Jung - Hyunn Choi, Kyoung - Tae Yoo, Hojungan, wansukehoi, japung - Koo, Jaeickim, Nyeon – Jun Kim: concludes that before and after comparison of flexibility according to taping, stretching and joint exercise revealed that all three groups showed statistically significant changes. ⁽¹⁵⁾ Zanab Saeed Albeshri and Enas Fawzy Yossef et al. ., suggests that applying K Tape as an immediate effect on Hamstring muscle extensibility. ⁽¹⁴⁾.

This graphical representation shows that The Scar Taping Technique is not effective in the term of reduction in the mean value of Modified Thomas Test (AROM) (Graph 1) from 27.5 to 27.5 and Modified Thomas Test (PROM) (Graph 2) from 35 to 35 but effective in the term of improvement in the mean value of Poplital Angle (AROM) (Graph 1) from 55 to 57.5 and Poplital Angle (PROM) (Graph 2) from 65 to 67.5 in 8th weeks. This study suggests that Scar Taping Technique is not effective in muscle Lengthening (not effective on hip but slightly shows improvement in knee) but shows some visual effects on scar. (Justyna Karwacinska, Wojchec Kiezbak, Beata Stepanek – Finda, inenezs, Kawalski, Halina Protasiewicz – Faldowska, Robert Trybulski, Malgorzata Starezynska: concludes that kinesio Tape application contribute to a positive cosmetic outcome and reduce limitation with respective Scar mobility which confirms the validity of introducing this form of treatment has one of the method for scar management. ⁽¹⁶⁾.

When comparing Active ROM and Passive ROM, Passive ROM is effective than Active ROM in the term of both Muscle Lengthening Taping Technique and Scar Taping Technique. When comparing both the taping techniques, Muscle Lengthening Taping technique is effective in improving the muscle length than Scar Taping Technique. But however Scar Taping Technique shows some visual and cosmetic effects. Further study needed for scar taping regarding its cosmetic purposes and recommends that if exercise or other manual techniques used along with Taping Technique might shows some improvement. Further studies needed in future on Scar Taping.

4. Conclusion

Based on the results of this study, it can be concluded that the Muscle: lengthening Taping Technique is effective in muscle lengthening while Scar Taping Technique, although showing some visual and cosmetic effects, does not significantly contribute to muscle lengthening.

Acknowledgement

It is my pleasure to express deep sense of gratitude towards VIDHYALAKSHMI, The chief Physiotherapist, Vels Medical College and Hospital, Manjaikaranai for her encouragement and critical review of this work at regular "Thesis Meetings" A Special word of appreciation for the kind co operation to my subject who believed in me and co operated to his/her extent. I owe my gratitude to ANANTHI (PT), who were very helpful in completing this study. Last but not least, i would like to thank my parents for financial support and my friends, Jayasurya and Pavithra for believing and motivating me throughout this study.

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