

A Study to Compare Kinesiotaping Technique with Heel Raise Exercises in Patients with Calcaneal Apophysitis

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Abstract: Calcaneal apophysitis, also commonly known as Sever's disease, is a condition seen in children usually aged between 8–15 years. Conservative therapies, such as taping, heel raise and orthotic intervention are accepted management practices for calcaneal apophysitis. Previous narrative literature reviews and opinion pieces provide some evidence for the use of heel raises or taping. However these two techniques have not been compared. Hence this study aims to compare kinesiotaping with heelraise and find out which treatment technique is more beneficial in the treatment of patients with calcaneal Apophysitis in reducing pain and disability. **Methodology:** A total number of 20 subjects are taken in to the study and divided into 2 groups of 10 in each group. Group A subjects are treated with kinesio taping of calcaneam for 20 minutes 3days a week for 8 weeks. Group B patients are treated with heel lifts for 20 minutes, 3days a week for 8 weeks. Heel raise are done in 4 stages. Level 1-The subjects sets on chair and lift the heel. Level 2 –The subjects stands behind the chair take support of the chair and lift the heel. Level 3 – The patient standing of the lift heel without support. Level 4- 5mm cork is used on lift on patient does heel raise. **Results:** The results of this study revealed that there was significant difference between the kinesiotaping (Group A) and heelraise(Group B) treatments. Although in both the groups, there was reduction in pain and disability, but significant improvement was seen in Group A subjects treated with kinesiotaping where p-value is <0.0001 that shows extremely significant improvement in Group A in reducing pain and disability when compared to Group B. **Conclusion:** Although the study showed beneficial results in both the groups, but the results reflected that kinesiotaping group(Group A) had better improvement than the other heel raise group(Group B) which was measured in terms of pain & disability reduction in patient with calcaneal apophysitis.

Keywords: Kinesiotaping technique, heelraise Exercises, calcaneal apophysitis

1. Introduction

Calcaneal Apophysitis (Sever's disease) is the most frequent cause of the heel pain in physically active Growing children^{1,2,3,4,5}. Calcaneal apophysitis is a condition seen in children usually aged between 8 -15 Years. Early in the 20th century, severe reported a condition characterized by pain in the posterior and Inferior Region of the heel in very active and (or) overweight children. Posterior heel pain classified as calcaneal apophysitis (or) Sever's disease maybe a common musculoskeletal injury in children^{6,7}. This was reported to be characterized by the enlargement of the epiphyseal line of the ossific nucleus of the calcaneus on radiographic examination with obliteration of the epiphyseal line. Calcaneal apophysitis is reported as a self limiting condition usually presenting between the ages of 8- 15^{9,10} years. But has been observed in children as young as six. The pain related to this inflammation is thought to cease after fusion of the calcaneus. Pain with walking and sport is often reported in this condition and is a cause of concern for both parent and child. The physical activity reported to produce the highest levels of pain include frequent running and jumping such as soccer. In rare cases, it has been reported that untreated calcaneal apophysitis can cause calcaneal apophyseal avulsion fractures. The diagnosis of Sever's disease is generally made with the typical history of posterior heel pain that exacerbates with physical activity and clinical examination findings of no (or) mild swelling without any local skin manifestations like erythema (or)

edema. Narrative literature reviews have recommended the following conservative treatment therapies such as Taping, Heel lifts, Orthoses, Mobilization, Stretching (or) Strengthening Exercise^{30,31}, rest, Ice³² and Non steroidal anti-inflammatory medication. The kinesiotaping is an additional viable treatment option for controlling heel pain during athletic and other weight bearing activities in patients with Sever's disease. The taping technique applied in this case series was effective in the immediate reductions of posterior heel pain during ambulation and allowed an early return to sports activities. Kinesiotaping has its origins in old fashioned taping for support stabilizing a sprained ankle, providing some arch support. The tape is applied with the affected muscle in a stretched position, taping from the origin of the muscle to the insertion point³⁴. The tape may have a small beneficial role in improving strength, range of motion in certain injured. There is limited evidence supporting many commonly employed treatment options aimed at reducing pain and disability. A heel lift, also known as plantar flexion, is performed by the gastrocnemius, soleus and plantaris, which make up the triceps muscle group on the back of the lower leg³⁶. Strong, healthy calf muscles are beneficial for daily activities, such as standing on tiptoe to reach something overhead, as well as walking, running and jumping. There are several heel lifts exercises to

- 1) Alternating heel lift
- 2) Seated heel lift
- 3) Standing heel lift

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The use of heel raise was reported in many of the studies. All of the studies reported that heellifts decreased pain associated with calcaneal apophysitis in children .It is thought that calcaneal apophysitis may develop from traction at the calcaneal apophysis from the gastronemius/soleus (or) impact forces at the open apophysis⁴⁴ .Stretching ,taping ,heel raise and different orthotic designs all are aimed at decreasing traction (or) impact at the calcaneal apophysis. However these two techniques that is taping and heel raise have not been compared. Hence this study aims to compare kinesiotaping with heelraise and find out which treatment technique is more beneficial in the treatment of patients with calcaneal Apophysitis in reducing pain and disability.

2. Methodology

A total number of 20 patients are included in the study after taking informed consent and divided into 2 Groups of 10 in each group. Group A subjects are given kinesiotaping for calcaneam and Group B subjects are treated with heel raises.Group A is given treatment of 20 minutes, 3days a week for 8 weeks and Group B subjects are given treatment for 20 minutes, 3days a week for 8 weeks.

3. Procedure

Kinesio Taping: The patient skin was cleaned with an alcohol pad to remove superficial Oils and dirt in an effort to effectively adhere the tape to the skin The tape was measured and cut from 2 inches proximal to the toes on the dorsum of the foot, and around the toes and under the foot and upto the distal one third of the gastrocnemius muscle. Foot was placed in relaxed position while the subject was made to lie prone on a taping table with the ankle in slight planter flexion. The first strip of tape was placed from the anterior midfoot, stretched approximately to 115%-120% of its maximal length and attached just below The anterior tibial tuberosity over the tibialis anterior muscle. The second strip began just above the medial malleolus and wrap around the heel like a stirrup, attaching just lateral to the first strip of tape. The third strip stretched across the anterior ankle, covering both the medial and lateral malleoli .Finally, the fourth strip originated at the arch and stretched slightly, measuring 4 – 6 inches above both the medial and lateral malleolus.

Heel Lifts/ Heel Raise: The starting position is standing flat on the floor , (or) even with a book under the heel if it is painful to lift the heel from a flat surface. The heel raise used within this study was a 5mm cork wedge covered with a thin elastic surface, and was reported to lift the heel 5mm in mid stance and push off. The treatment was given for 20 minutes for 3days a week for 8 weeks. . Heel raise are done in 4 stages. Level 1-The subjects sets on chair and lift the heel. Level 2 –The subjects stands behind the chair take support of the chair and lift the heel. Level 3 – The patient standing of the lift heel with out support. Level 4- 5mm cork is used on lift on patient does heel raise. Before the treatment and after treatment pain was measured using Viual Analog scale and disability measured using Foot Function Index.

Figures showing application of kinesiotaping



Figures showing Heel raise Exercises



4. Date Analysis and Results

Table 1: Comparison of Pre and Post Values of VAS in Group A

	Mean	Standard Deviation	P –Value	T –Value
PRE	7.9	0.8756	<0.0001	14.957
POST	2.6	0.6992		

Table 2: Comparison of Pre and Post of VAS in Group B

	Mean	Standard Deviation	P –Value	T –Value
Pre	8.2	0.7888	<0.0001	5.787
Post	6.3	0.6749		

Table 3: Comparison of Post VAS in Group A Versus Group B

	Mean	Standard Deviation	P –Value	T –Value
Pre	2.6	0.6992	<0.0001	12.075
Post	6.2	0.6325		

Table 4: Comparison of Pre and Post Values of FFI in Group A

	Mean	Standard Deviation	P-Value	T-Value
Pre	84.5	3.837	<0.0001	26.474
Post	38.4	3.950		

Table 5: Comparison of Pre and Post FFI in Group B

	Mean	Standard Deviation	P-Value	T-Value
Pre	85.3	4.322	<0.0001	11.489
Post	55.2	7.068		

Table 6: Comparison of Post FFI in Group A Versus Group B

	Mean	Standard Deviation	P-Value	T-Value
Pre	37.8	3.225		7.159
Post	55.5	7.122		

5. Discussion

Based on the results above it is seen that subjects in both the groups GROUP A and GROUP B showed reduction in pain and disability but significant reduction in pain and disability was seen in GROUP A treated with kinesiotope of the calcaneum when compared to GROUP B who were treated with heel raise. The reduction in calcaneal pain in both the groups maybe because kinesiotope and heel raise reduced the traction pull of the tendoachilles on the calcaneal surface. Kinesiotape is a thin cotton fabric .The tape can be stretched up to 140 percent of the original length⁴⁵. After taping, the mobility of the applied muscle or joint can still be maintained at full range⁴. By applying kinesiotope on the calcaneum and calf muscles, the pulling force of the plantar flexors and the plantar fascia can be reduced. Thus calcaneal apophysitis pain can be reduced. The possible improvement in the local circulation may also facilitate the resolution of the injury –induced inflammation. Kinesiotape may improve blood and lymph circulation and decrease pain⁴⁷(kase et al ,2003). Kinesiotape has an elasticity of 130-140% which allows ankle movement in both dorsiflexion and plantar flexion⁴⁸.The tension of kinesio tape created by increased stimulation during active ankle movement may have also created tension in the soft tissue structures⁴⁹ (kaya, e, 2011).Increased tension may facilitate a pain inhibitory mechanism by providing an afferent stimulus to large diameter nerve fibers to mitigate nociception⁵⁰, (fredberg ,u Bolving 2002) as the patients pain levels was reduced the fear of pain during ankle movement might have been reduced pain and improving ankle range of motion⁵¹. (Gonzalez et al 2009) .The cause of calcaneal apophysitis is due to the abnormal force (or) pressure to the calcaneum. When a patient has high foot arch, the calcaneal becomes too tight, and the calf muscles and the Achilles tendon are also too tight. There are several theoretical benefits claimed for the tape. One of those Is correcting the alignment of weak muscles as well as facilitating joint motion as a result of the tape’s recoiling qualities. Heel raise on the other hand reduce the load on the achille tendon⁵² and limit pronation thus reducing traction pull at the achilles tendo⁵³. The use of heel raise was reported in many of the studies⁵⁴. All of the studies reported that heel raise decreased pain. the heel raise used within this study was a 5 mm cork wedge covered with a thin elastic surface, and was reported to lift the heel 5 mm in mid stance and push off.⁵⁵ Two –legged (or) one legged

heel raise going up on to the toes is a concentric calf muscle contraction and lowering the heel down to the floor Is an eccentric calf muscle contraction. The starting position of a heelraise should be with a book under the heel, if painful to start with the heel on the floor. The purpose of the heel raise is to place the ankle in a slight plantar – flexed postion which would deviate some of the pull and compression of the Achilles tendon on to the calcaneus. One causative factor of increased tension (or) shortness of the Achilles tendon may be due to the rapid growth in adolescents This soft tissue change may have the potential to place an interim strain (or) traction on the apophysis at the insertion⁵⁶. A simple heel raise has been advocated to reduce this strain when foot wear is worn⁵⁷. Thus heel raise to some extent reduced pain and disability in this study. But subjects treated with kinesiotope (Group A) showed significant reduction in pain and disability when compared to subjects with heel lifts (Group B) because of the above mentioned reasons. Hence kinesiotope can be safely used in children to reduce pain and disability.

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