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Effect of K-Taping with Therapeutic Ultrasound on Hamstring Avulsion Injury-Case Report

Shabana Khan[1*], Nourah Al Muhanna[2]
1.Physiotherapist at female Ortho OPD at Prince Sultan Military Medical City- Riyadh-KSA
2. Clinical Supervisor, at female Ortho OPD at Prince Sultan Military Medical City-Riyadh- KSA

ABSTRACT

Rehabilitation of sports related hamstring injuries is challenging as it requires safe and early return to sport. This is because hamstring injuries need time to recover and has high rate of re injury. In our case report, 21‑year‑old female student, involved in sports activity (weight lifting), who was rehabilitated for left hamstring avulsion injury was briefed to report and elucidate the importance of hamstring injury treatment conservatively and to describe a rehabilitation program on athletes with clinical outcome. She was conservatively treated with K-Tape with therapeutic ultrasound, twice a week, once a day for three weeks duration. At the end of third of intervention- pain, muscle strength and range of motion was assessed. She had no impairment or functional limitations, including full range of pain‑free movement of left leg, pain 0/10 by VAS score. By the 4th week, she started to perform sports specific drills. She was rehabilitated and set fit to play after 6 weeks from the date of injury. K-Tape with therapeutic ultrasound is effective in hamstring injuries. In this case study, rehabilitation program with an emphasis on K-Tape with therapeutic ultrasound is found to be effective in returning the weight lifter back to play.

Keywords: K-Tape, Ultrasound, rehabilitation, stretching exercise

*Corresponding Author Email: shabanagkp21@gmail.com
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INTRODUCTION

Hamstring muscle strain is a frustrating injury, well known to medical staff, coaches, and athletes. It is frustrating because the symptoms are persistent, healing is slow, and the rate of re injury is high[1].

An athletes can have hamstring injury in wide variety, including strains, complete or partial avulsions of proximal hamstring tendon or is chial apophysis, proximal hamstring tendinitis, and referred pain in posterior thigh [2,3]. These, hamstring strains are the most prevalent hamstring-related injury resulting in loss of time for athletes at all levels of competition[2-8]. Elkstrand et al. demonstrated that hamstring injuries account for 37% of total muscle injuries in football players and for 25% of athlete's absence in games. Other studies indicate that one-third of hamstring injuries relapse and that many of these relapses take place within the first two weeks after returning to sport[9,5,10]. The aims for these injuries rehabilitation are to reach the same level of function as found before injury and to allow athletes to return to previous sport with minimum risk of recurrence[11]. Many interventions are widely used to achieve full rehabilitation. These include PRICE (protection, rest, ice, compression, and elevation), to control the inflammatory process[12]; therapeutic exercises to strengthen and restore the functionality of the musculature[13]; photo thermal therapy for inflammation modulation; massage and mobilization to realign and relieve tension of soft tissues; manual therapy for joint and nerve; and functional rehabilitation. However, evidence of the effectiveness of these treatment modalities is not yet fully established, due to the sparse scientific research on the subject[14]. Hamstrings are the long and powerful group of muscles that span the back of the thigh. The collective term "hamstrings" refers to four muscles (semitendinosus, semimembranosus, long and short head of biceps femoris) located in the posterior compartment of the thigh. In European elite football, hamstring injury is the most common diagnosis: 12% of all injuries are hamstring injuries[15].

In general, it is believed that hamstring injuries occur primarily during activities or sports that demands extreme speed and power. However, recent studies suggest that hamstring strain or injuries can occur also in slow speed stretching exercises[16].

Sun-Min and Jung-Hoon Lee, 2018. use K-Tape on his study to know, effects of balance taping on hamstring muscle injury and traumatic knee pain incurred by an amateur university football player as a result of tackling during a football game[17]. Therapeutic ultrasound can work as either a superficial or a deep heating modality depending on the frequency used. While 3 MHz ultrasound (US) provides superficial heating, 1 MHz US heats tissues at depths of 3-5 cm and is considered to be a deep heating agent. US produces heat through high frequency acoustic

vibrations. This type of energy transmission that it is minimally hindered by adipose tissue due to its high water content[18].

The research regarding effects of K Taping (KT) along with therapeutic ultrasound on hamstring avulsion injury is lacking and is not enough, so we are describing a case of a hamstring injury to know the effect of KT with US on hamstring injury.

CASE REPORT

A 21-year-old student female patient who involved in sports activity (weight lifting), suffering from pain in the posterior thigh since one month. She reveals history of lifting heavy weight in splinting like position, developed severs pain in left buttock. She attended emergency ward. Physical examination revealed ecchymosis on proximal posterior part of thigh and advised by physician to apply ice on injured area for 10 min 2-3 times a day along with a non-steroidal anti-inflammatory drug. A diagnosis of partial hamstring avulsion injury was made one the basis of MRI report and referred to physical therapy department for conservative treatment. During triage in physiotherapy department her overall health was excellent. She cleared all red flags and appointed as urgent case in orthopedic outpatient department of physiotherapy. On the day of assessment she showed no symptoms of swelling, gait deviation, numbness and tingling. However, decreased stability when trying to balance on left leg. She reported a score of 6/10 on Visual Analog Scale (VAS) (where 0 indicates no pain and 10 maximum possible pains) for pain, normal range of motion and muscle power of 4/5 for left leg, before intervention. The patient was treated for hamstring injury with K-Taping along with ultrasound, with strengthening exercise protocol for 6 sessions, 2 times per week, once a day for 3 weeks. Anti-inflammatory drug previously taken with slight improvement in symptoms. The main aim for physiotherapy included decreasing pain, improving muscle strength, balance and return to sport.

TREATMENT

Patient was treated with Enraf-Nonius 434 ultrasound therapy device, with continuous therapeutic ultrasound, was administered 2 times/week for 3 weeks for 6 sessions. The ultrasound treatment was administred with a power of 0.8 W/cm2, a frequency of 1 MHz, continuously, 7 min on the proximal hamstrings near ischeal tuberosity [19], after ultrasound therapy stretching was applied immediately. The stretching exercise was carried out as follows: Starting Position: patient assumed the full supine -lying position on a plinth with her two feet pointing upwards. The contra-lateral lower limb was securely strapped to the plinth using 2 slings positioned across the thigh and over the anterior superior iliac spine to stabilize the pelvis. The lower limb being stretched was passively moved into the extreme of extension, up

to the limit where the patient felt a gentle stretch at the posterior aspect of the thigh. This placed the hamstring muscles at their greatest possible length. The stretch was sustained for 30 seconds, after stretching exercises K-Tape is applied by using pink color 5 cm wide kinesio tape to the hamstrings using the Y-shaped taping technique[20-21]. K-tape was applied un stretched to the neutral body position, on the semitendinosus, semimembranosus, and biceps femoris of the hamstring muscles of the left lower extremities in order to achieve a relaxing effect.[22]. To use the correct length of the tape for patient, were measured in a stretched position from the medial or lateral condyle of the tibia to the ischial tuberosity. The patient was advised to perform combination of weight-bearing and non–weight-bearing exercises. Initial program consisted of the following 2 exercises, performed 1 to 2 times daily, using controlled motions and a slow eccentric phase over approximately 5 seconds: seated hamstring curls and supine hamstring curls. The patient was instructed to perform the eccentric strengthening to the point of reproducing his typical tendon pain, as long as the pain was not progressively getting worse or disabling. Three sets of 15 repetitions were to be performed for each exercise as home exercise program.

The procedure was carried out twice a week for 3 consecutive weeks. There was no pain (0/10) reported on VAS after intervention and no impairment or functional limitations, including normal range of motion of left leg.

DISCUSSION

The patient reported no pain, muscle power of 5/5 and full range of motion of left leg during activities of daily living. She was able to resume her sports without pain. There was significant reduction in pain after K-tape session with therapeutic ultrasound.

Lee and Choi 2016, suggested during a football game, the knees and hamstring muscles are particularly more vulnerable to injury[23]. Sun-Min, Jung-Hoon Lee 2018, were used balance taping technique and test methods to treat pain caused by hamstring muscle and traumatic knee flexion injuries. Because the hamstring muscle is the primary source of movement during knee flexion, which caused pain in our patient, a contact test was performed for the hamstring muscle prior to balance taping to confirm whether hand contact decreased pain during knee flexion. Subsequently, tactile stimulation was provided by kinesiology tape, instead of the hands, to the semimembranosus and biceps femoris, which form the hamstring muscle[17]. The application of kinesiology tape enhances proprioception by stimulating cutaneous mechanoreceptors[17,24].

Merino et al. (2010) in a pilot study with 10 healthy male triathletes (age 29.40 ± 9.07 years) on lower back and hamstring flexibility found significant improvement ($p<0.05$) as a result of the use of KT measured by the SRT[25]. Yoshida and Kahanov (2007) in a study on the effect of KT in the ROM of the trunk carried out on 30 healthy university student volunteers (15 females

26.9 ± 5.9 years, 20 males and 15.9 ± 12.1 years), observed that there were significant differences ($p<0.05$) in the ROM of the trunk flexors measured with toe touch test. However, they found no significant differences ($p>0.05$) in the scores of the lateral flexion and trunk extension[26].

Kendall et al., 2007; Travell and Simons, 2004, found of the effectiveness of KT on flexibility might be more effective for people with muscle shortness. Looking at results obtained in this research, we encountered students clearly within the normal hamstring extensibility range[27,28].

Emad T Ahmed 2014, found on his study that static stretching was effective in increasing hamstring flexibility which coincide with other study[19] which stated that passive static stretching is the best option for the improvement of both active and passive range of motion. Two mechanisms are essentially considered responsible for ROM increase after muscle stretching: in the first one, an alteration in the sensitivity of pain receptors increases stretching tolerance and, consequently, the effectiveness of the techniques[29], and in the second one, changes in tissue viscoelasticity, such as the decrease in the passive tension of the muscle tendon unit immediately after stretching, are the primary reasons for the flexibility gain[30].

US can be used to target the collagen-rich tendinous units of the hamstring muscles because of its ability to penetrate deeper tissues. Several researchers have demonstrated the beneficial effects of heat on collagenous tissue[31,32].

Funk et al performed a study comparing MHP treatments without a stretch and a stretching routine alone on hamstring extensibility. They found that MHP treatments resulted in significant increases in hamstring extensibility compared with the stretching routine. Because we found no significant difference between MHP and US treatments, it can be inferred that an US treatment would also be more effective than a stretching routine[33].

All the above study strongly supports our result.

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