

Effect of balance taping using kinesiology tape for a hamstring muscle injury and traumatic knee pain in an amateur university football player

A case report

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Abstract

Rationale: Football players are at high risk for lower extremity injuries because they turn on an axis of rotation, turn while decelerating, and repeatedly jump and land. One of the most common sites of injury is the knee.

Patient concerns: A 25-year-old amateur university football player with pain in the knee medial area (Visual Analog Scale [VAS] score of 6/10), a hamstring muscle injury (VAS of 5/10), and a Tegner Activity Scale level of 3.

Diagnoses: He was diagnosed as hamstring muscle injury and traumatic knee pain.

Interventions: Balance taping was used for 1.5 months (average, 16h/d).

Outcomes: The Tegner Activity Scale level increased from 3 to 9 after balance taping, indicating increased activity ability. VAS scores for pain in the medial area of the knee and hamstring muscle during knee flexion decreased from 6 and 5 to 0 and 0, respectively. Based on these improvements, the patient was able to resume playing.

Lessons: Balance taping is an effective treatment for football players with a hamstring muscle injury and traumatic knee pain.

Abbreviation: VAS = visual analogue scale.

Keywords: balance taping, football, hamstring muscle, kinesiology tape, knee pain

1. Introduction

Football (also known as soccer in the United States) is a sport that involves intermittent walking, jogging, running, and sprinting.^[1] Football players are at high risk for lower extremity injuries because they turn on an axis of rotation, turn while decelerating, and repeatedly jump and land.^[2] One of the most common sites of injury is the knee.^[3]

Approximately 37% of all football-related muscle injuries occur in the hamstring muscle,^[4] and these can be classified as stretching injuries and high-speed running injuries.^[5–7]

Hamstring injuries have the highest recurrence rate and are known to be associated with training.^[2,5,8]

A considerable number of injuries that occur during a football game are contact injuries, with 75% reported as a result of aggressive tackling.^[9]

Therefore, we aimed to investigate the 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.

2. Case report

A 25-year-old amateur university football player incurred a hamstring muscle injury and pain in the medial area of the right knee during flexion after being tackled by an opponent during a football game approximately 2 months previously. Other than 2 sessions of physical therapy during the acute phase, he did not receive any treatment. He was only performing stretching exercises on his own and had to stop playing due to pain.

During the initial examination, pain measured by the Visual Analog Scale (VAS; 0: no pain; 10: the worst pain imaginable) in the medial area of the right knee and hamstring muscle yielded scores of 6/10 and 5/10, respectively, during knee flexion while in the standing position. The Tegner Activity Scale level (0: sick leave or disability pension because of problems; 10: competitive sports such as soccer, football, rugby [national elite] are permissible) was 3 (work involving light labor [nursing, etc.] is permissible).^[10] Manual muscle testing of right knee flexion and extension yielded fair (normal: able to move in a full range of motion against gravity and maximum resistance; zero: no contraction at all) results.^[11] To assess the ability and muscle

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strength to endure loads inflicted on the legs during sports-specific activities,^[12] the single hop for distance (single hop) was performed with both legs.^[13] The left single hop result was 144 cm, and the right single hop (injured leg) result was 47 cm. Hamstring flexibility was measured with the active 90–90 hamstring test (90–90 straight leg raising test).^[14,15] The results were -21° for the left leg and -51° for the right leg. Written informed consent was obtained from the patient for the publication of this case report.

According to Lee and Choi's balance taping guidelines,^[16] the contact and movement test was performed prior to balance taping to reduce right knee medial pain and hamstring muscle pain during flexion in the standing position.^[16] During the first step of the contact and movement test, the skin surface covering the hamstring muscle was touched with the palm of the hand (contact test), and knee flexion, during which the pain was most severe, was performed again (movement test) to confirm whether pain was reduced.^[16] During the second step, to induce patellar inferior gliding, an arthrokinematic outcome of knee flexion, knee flexion was performed again (movement test) while manually pressing down on the patella to confirm whether pain was reduced.^[16] During the third step, to induce tibial internal rotation, an arthrokinematic outcome of knee flexion, knee flexion was performed again (movement test) while manually internally rotating the tibia to confirm whether pain was reduced.^[16]

Based on the results of the contact and movement test, balance taping of the medial right knee and hamstring muscle because of pain during knee flexion in a standing position was performed using kinesiology tape (BB TAPE; WETAPE, Paju, Korea) that remained in place for 16 hours per day for 1.5 months. To prevent skin irritation, the 2 ends of the kinesiology tape (approximately 2–3 cm) were not stretched.^[16–19]

Balance taping to decrease hamstring muscle pain and improve functions was performed for the hamstring muscle with approximately 20% stretch using 5-cm-wide kinesiology tape while the patient was in the prone position. The tape was first applied from the ischial tuberosity to the medial surface of the tibia to cover the semimembranosus muscle, which is a component of the hamstring muscle (Fig. 1 A).^[16] Subsequently,

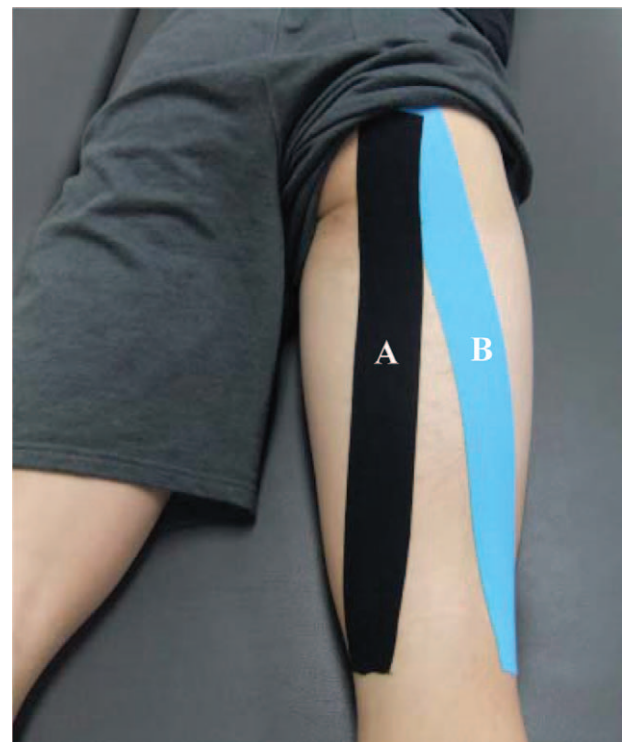


Figure 1. Balance taping using kinesiology tape for a hamstring injury.

the kinesiology tape was applied from the ischial tuberosity to the fibular head to cover the biceps femoris muscle (Fig. 1B).^[16]

Balance taping to promote patellar inferior gliding was applied from the patella toward both proximal tibia in a horseshoe shape with approximately 30% to 40% stretch using 2.5-cm-wide kinesiology tape (Fig. 2A).^[16] To strengthen patellar inferior gliding, 2.5-cm-wide kinesiology tape was applied again with 50% overlap and approximately 30% to 40% stretch (Fig. 2B).^[16]

Balance taping to promote tibial internal rotation of the tibiofemoral joint was applied by wrapping 5-cm-wide

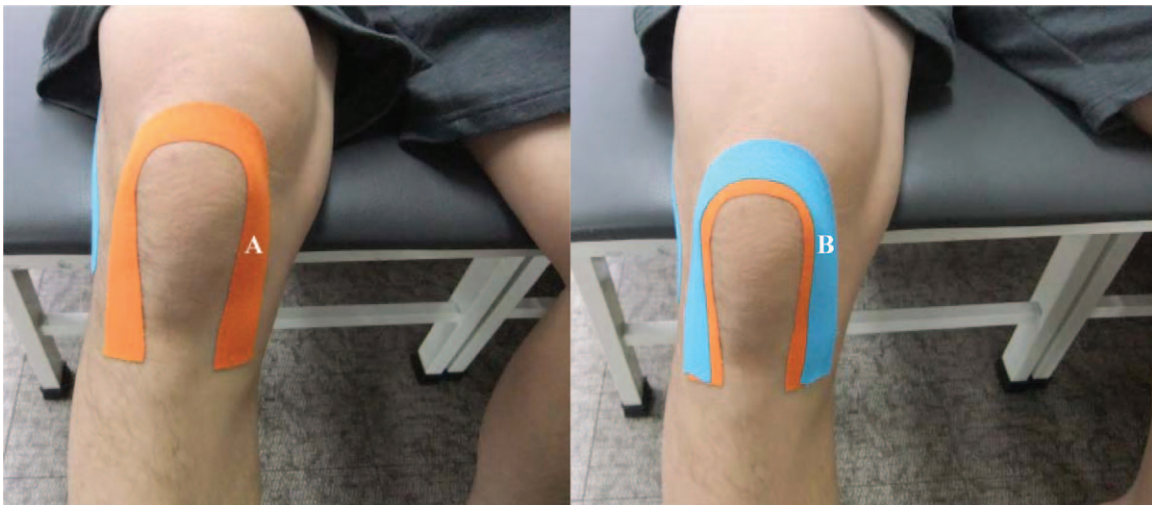


Figure 2. Balance taping using kinesiology tape for patellar inferior gliding.



Figure 3. Balance taping using kinesiology tape for tibial internal rotation of the tibiofemoral joint.

kinesiology tape medially from below the patella to the femur with approximately 20% to 30% stretch (Fig. 3A).^[16] To strengthen tibial internal rotation, 5-cm-wide kinesiology tape was again applied with 50% overlap and approximately 30% to 40% stretch (Fig. 3B).^[16]

After repeated balance taping, the VAS pain scores for medial right knee pain and hamstring muscle pain during knee flexion decreased from 6 and 5 to 0 and 0, respectively. The Tegner Activity Scale level increased from 3 to 9 (competitive sports such as soccer, football, rugby [lower divisions], ice hockey, wrestling, gymnastics, and basketball are permissible). The manual muscle test of right knee flexion and extension resulted in an improved grade from fair to normal, and the single hop performed with the right leg result improved from 47 to 187 cm. The active 90–90 hamstring test of the right leg yielded an improvement from -50° to -15° , indicating increased hamstring muscle flexibility. Based on these improvements, the patient was able to start playing again.

3. Discussion

The results of this case study showed that balance taping enabled an amateur university football player to resume playing because it decreased the pain associated with his hamstring muscle and traumatic knee flexion injuries.

During a football game, the knees and hamstring muscles are particularly more vulnerable to injury. In the present case, the balance taping technique and test methods suggested by Lee and Choi^[16] were used 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.^[16] Tactile stimulation activates large-diameter fibers such as A-beta fibers. In contrast, nociception activates small-diameter fibers such as C-fibers and A-delta fibers.^[20] The application of kinesiology tape enhances proprioception by stimulating cutaneous mechanoreceptors.^[21,22] Pain reduction is thought to occur through stimulation of A-beta fibers connected to low-threshold mechanoreceptors (located in the muscles, joints, tendons, and skin) in the pain area.^[21,22] Stimulation of the mechanoreceptors through kinesiology tape is projected to the brain through A-beta fibers and may activate inhibitory interneurons, thus blocking pain conducted by A-delta and C-fibers.^[20,23] Therefore, tactile stimulation provided by kinesiology taping of the injured hamstring muscle decreased pain.

Various forms of skin stimulation, such as contact and vibration, have been reported to increase muscle strength by inducing the gamma motor reflex through the cutaneous fusimotor reflex.^[24] A previous study reported that providing tactile stimulation through kinesiology taping around the knees activates the gamma motor neurons, thereby indirectly increasing attenuation of Ia afferent activity and mitigating quadriceps femoris muscle weakness.^[21] Similarly, providing tactile stimulation to the injured hamstring muscle through kinesiology taping could activate the gamma motor neurons, thereby inducing smooth physiologic contraction of the muscles. With smooth muscle contraction, recovery of hamstring muscle functions could be facilitated, thus leading to improved manual muscle test results and flexibility as assessed via the active 90–90 hamstring test and improving the knee flexion functions.

From an arthrokinematic perspective, patellar and tibiofemoral joint movements must be normal during knee flexion; however, knee flexion induced pain in our patient.^[16] Prior to balance taping to induce patellar inferior gliding and tibial internal rotation on the tibiofemoral joint, which should occur during knee flexion, we performed a manual contact and movement test to confirm any improvements in knee flexion

functions and reductions in pain.^[16] According to the balance taping guidelines,^[16] kinesiology tape was applied twice with approximately 30% to 40% stretch and 50% overlap to strengthen patella inferior gliding and tibial internal rotation of the tibiofemoral joint.^[17] Repeated kinesiology taping could contribute to inducing patella inferior gliding and tibial internal rotation of the tibiofemoral joint during knee flexion.^[25] Furthermore, even if the knee returns to superior gliding and tibial external rotation of tibiofemoral joint after kinesiology taping, the increased tension of the kinesiology tape could induce inferior gliding of the knee joint and tibial internal rotation of the tibiofemoral joint during knee flexion.^[25] Although this was not a study of knees, previous studies reported that repeated applications of kinesiology tape to the forward pelvis^[26] and depressed scapula due to scapular depression syndrome^[27] induced mechanical correction, thereby decreasing pain. Therefore, repeated balance taping could improve knee flexion functions by promoting patella inferior gliding and tibial internal rotation of the tibiofemoral joint. One limitation of this study is that it is a single case study. Therefore, the treatment could not be compared with other treatment methods. The findings of this case report suggested that balance taping can be used as a complementary treatment for patients with a hamstring muscle injury and traumatic knee flexion pain.

Author contributions

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Investigation: Sun-Min Lee.

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Writing – review & editing: Sun-Min Lee, Jung-hoon Lee.

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