Journal of Bodywork & Movement Therapies 21 (2017) 835–839

Contents lists available at ScienceDirect

Journal of Bodywork & Movement Therapies

journal homepage: www.elsevier.com/jbmt

ORIGINAL RESEARCH

Effects of Kinesio Taping® on knee function and pain in athletes with patellofemoral pain syndrome

Elaheh Aghapour [a], Fahimeh Kamali [a, b, *], Ehsan Sinaei [a]

[a] Department of Physical Therapy, School of Rehabilitation Sciences, Shiraz University of Medical Sciences, Shiraz, Iran
[b] Rehabilitation Sciences Research Center, Shiraz University of Medical Sciences, Shiraz, Iran

ARTICLE INFO

Article history:
Received 27 August 2016
Received in revised form
13 January 2017
Accepted 21 January 2017

Keywords:
Patellofemoral pain syndrome
Kinesio Tape®
Isokinetic
Athletes
Vastus medialis obliquus

ABSTRACT

Objective: To compare the knee performance and pain in athletes with patellofemoral pain syndrome (PFPS) before and after applying Kinesio Tape® (KT) on vastus medialis obliquus (VMO) muscle.
Participants: Fifteen participants (10 females, five males) with unilateral PFPS were examined and compared under taped and untaped conditions.
Intervention: VMO of the involved leg was taped from origin to insertion, with 75% of KT's maximal length tension.
Main outcome measures: Maximal eccentric and concentric peak torques of quadriceps were measured at 60 and 180°/s angular velocities by an isokinetic dynamometer. Functional performance and pain were evaluated by functional tests (step-down and bilateral squat) and visual analog scale, respectively.
Results: Paired *t*-test showed statistically significant increase in VMO peak torque and also repetition of step-down test and bilateral squat after using KT. Pain intensity was also decreased significantly following KT application ($p < 0.05$).
Conclusions: KT application over VMO can decrease pain and improve the functional performance, generally and quadriceps muscle strength, particularly, in athletes with PFPS. However, more research is needed to evaluate the long-term effects of this therapeutic procedure.

1. Introduction

Patellofemoral pain syndrome (PFPS), which feels like a diffuse retropatellar or peripatellar pain aggravated by activities, is the most prevalent diagnosed orthopedic pathology in physically active individuals (McConnell, 1986). It is also one of the most common knee disorders experienced by athletes in a variety of sports (Bolgla and Boling, 2011), which accounts for about 30% of all injuries seen in sport medicine clinics and 9% of all injuries in young athletes (LaBella, 2004). In addition to pain, feelings of crepitus and functional deficits are other related manifestations of PFPS (Al-Hakim et al., 2012) that generally leads to decreased activity level. This problem can also cause athletes to limit their sporting activities (Petersen et al., 2014). Retropatellar localized pain gets aggravated during physical activities e.g. stair climbing, squatting and prolonged sitting, which can increase the load on the patellofemoral joint (Whittingham et al., 2004). The precise underlying etiology of PFPS is still unknown. However, it is believed that quadriceps weakness, increased Q-angle, joint laxity, overuse injuries and biomechanical changes in lower extremity are the main contributing factors (Loudon et al., 2002; Whittingham et al., 2004). Among the above-mentioned factors, quadriceps muscle strength is a key parameter that is closely associated with PFPS (Herrington, 2001; Goharpey et al., 2007; Osorio et al., 2013). The evidences show that the quadriceps muscle is generally weaker in patients with PFPS than in healthy individuals (Osorio et al., 2013). Quadriceps inhibition and atrophy can lead to decreased muscle peak torque, which is a defined predisposing factor for PFPS (Herrington, 2001). Muscle imbalance in the heads of the quadriceps, i.e. vastus medialis obliquus (VMO) and vastus lateralis (VL) can eventually lead to patellar tilting to the lateral side of the knee joint, which in turn aggravates the symptoms (Lee and Cho, 2013). It is reported that VMO strength plays an important role in opposing PFPS symptoms through acting as a dynamic medial stabilizer of the patella. That is to say, insufficiency and delay in VMO activation can lead to lateralization of the patella, known as “patella maltracking”,

* Corresponding author. School of Rehabilitation Sciences, Shiraz University of Medical Sciences, Chamran Blvd., Abiverdi 1 St., P.O.Box:71345-1733, Shiraz, Iran.
E-mail address: fahimekamalii@gmail.com (F. Kamali).

http://dx.doi.org/10.1016/j.jbmt.2017.01.012
1360-8592/

Nomenclature

PFPS	patellofemoral pain syndrome
KT	Kinesio Tape®
VMO	vastus medialis obliquus
VL	vastus lateralis
VAS	visual analog scale

which consequently decreases the function of the knee joint (O'Sullivan and Popelas, 2005; Lee and Cho, 2013).

PFPS treatment symptoms can be clinically challenging due to its multifactorial nature. Up to now, a variety of therapeutic methods has been practiced in order to address PFPS including electrotherapy modalities (Lake and Wofford, 2011), stretching and strengthening exercises (Alba-Martín et al., 2015), balance training (Mahmoud and Kamel, 2015), patellar braces (Lun et al., 2005), patellar mobilization (Stakes et al., 2006), biofeedback training (Park and Kang, 2014), and so forth. However, athletes usually prefer therapeutic measures which do not restrict their ability to participate in their sporting activities. With respect to this issue, KT, which has gained in popularity over recent years, can be an ideal option to treat PFPS.

KT is one of the most commonly used stretchable tapes in sport injuries in terms of prevention, treatment and also enhancing athletes' performance (Wong et al., 2012; Montalvo et al., 2013). KT and its method of application were first introduced by Kenzo Kase in 1973 (Tsai et al., 2009). Depending on the direction of application, KT may have facilitatory or inhibitory effects on the muscle (Kase et al., 2003). Despite the prevalence of KT application in recent years, its efficiency in use for injured athletes is still a matter of debate (Montalvo et al., 2013), while there is limited evidence which supports its role in facilitating muscle strength in PFPS (Kase et al., 2003; Wong et al., 2012; Montalvo et al., 2013). According to Herrington, (2001), patellar taping can significantly improve pain and quadriceps strength in subjects with PFPS. In another study, Freedman reported that KT can significantly decrease pain and improve functional performance in individuals with PFPS, while sham KT does not have any therapeutic effect (Freedman et al., 2014). Conversely, the results of the previous studies have indicated that KT probably is not capable of enhancing muscle strength in healthy subjects (Fu et al., 2008; Wong et al., 2012).

To the best of the author's knowledge, to date, no study has examined the effect of applying KT specifically for VMO in athletes with PFPS. As a consequence, the present study was designed in order to investigate the effectiveness of KT as an accessible, simple to apply, and non-invasive technique on knee performance in athletes with PFPS.

2. Method and materials

2.1. Subjects

Fifteen athletes (ten females and five males) with unilateral PFPS who had been referred to sport physiotherapy clinics of Shiraz University of Medical Sciences in Shiraz, Iran, from December 2013 to March 2014, were recruited by simple sampling. Sample size was calculated with SPSS software on the basis of information from a previous related study ($\alpha = 0.05$, $\beta = 0.2$, power = 80%) (Wong et al., 2012). All subjects gave informed consent prior to their participation and an ethical code was obtained from Ethics Committee, Vice-Chancellory for Research of Shiraz University of Medical Sciences (Reference number: CT-92-6832). The patients were included if they had received at least three sessions of 2-hour physical activity per week, over six months prior to the study.

Reporting aggravating anterior knee or retropatellar pain during hopping and running, ascending and descending steps, squatting and prolonged sitting, as well as obtaining scores between 45 and 70 (out of 100) on the Kujala questionnaire (Nijs et al., 2006) and scores between three to six (out of 10) on visual analogue scale (VAS) during resistive knee extension were the other inclusion criteria. We considered the upper point of six for VAS and lower point of 45 for Kujala, in order to exclude subjects with high levels of pain and disability, who were assumed not to be able to complete functional tests and isokinetic evaluations. In addition, at least one of these valid diagnostic tests of PFPS, i.e. eccentric step down, patellar apprehension and vastus medialis coordination tests had to be positive (Nijs et al., 2006). We recruited only the participants who suffered from PFPS in their dominant leg in order to avoid bias in evaluations. The patients were excluded if they had neurological or rheumatoid diseases, low back or hip pain, fractures or surgeries in their lower limbs, received physical therapy treatments or cortico-steroid injections in the knee joint over the past three months and used opioid or analgesic drugs in the previous 72 h prior to the study. Patients with internal knee derangements and problems related to meniscus, ligaments or tendons as well as patellar subluxation or dislocation and subjects with bilateral PFPS were also excluded. An orthopedist confirmed the definite diagnosis of PFPS.

2.2. Procedures

All 15 participants were asked to attend two sessions with one week interval between, in order to avoid carry-over effects. During the first session, subjects completed the Kujala questionnaire and their characteristic data were recorded and isokinetic and functional tests were carried out without any intervention. During the second session, VMO of the involved leg was taped and then all the assessments were repeated. Pain intensity was also evaluated by VAS, at the beginning and end of each session and the mean difference of pain pre-post performing isokinetic and functional tests in each session was considered for analysis.

2.3. Intervention

The patient's shaved thigh was cleaned with alcohol. With the patient lying supine with hip in 30° and knee in 50° flexion, VMO was taped with a 5-cm Y-shaped KT (Kinesio Tape® -South Korea) from the origin to the insertion, in order to gain facilitatory effect (Słupik et al., 2006). This method of application is defined by Kenzo Kase as the standard KT application for VMO (Kase, 2016) (see Fig. 1).

Fig. 1. Vastus medialis obliquus kinesio taping.